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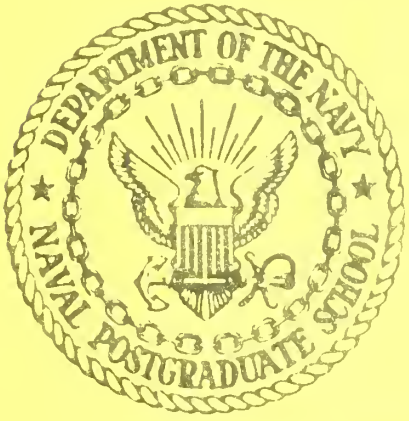

HYDROGRAPHIC DATA FROM THE OPTOMA PROGRAM, OPTOMA15, 24 JANUARY - 23 FEBRUARY 1985

by

Paul A. Wittmann
Edward A. Kelley, Jr.
Christopher N.K. Mooers

April 1985

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The two cruises, Leg DI and DII, and one AXBT flight Leg P were undertaken in January and February 1985. This report presents the hydrographic data acquired by XBT, AXBT and CTD casts, from the cruises and the flight.

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Hydrographic Data from the **OPTOMA** *Program:*

OPTOMA15

24 January - 23 February, 1985

by

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Christopher N. K. Mooers

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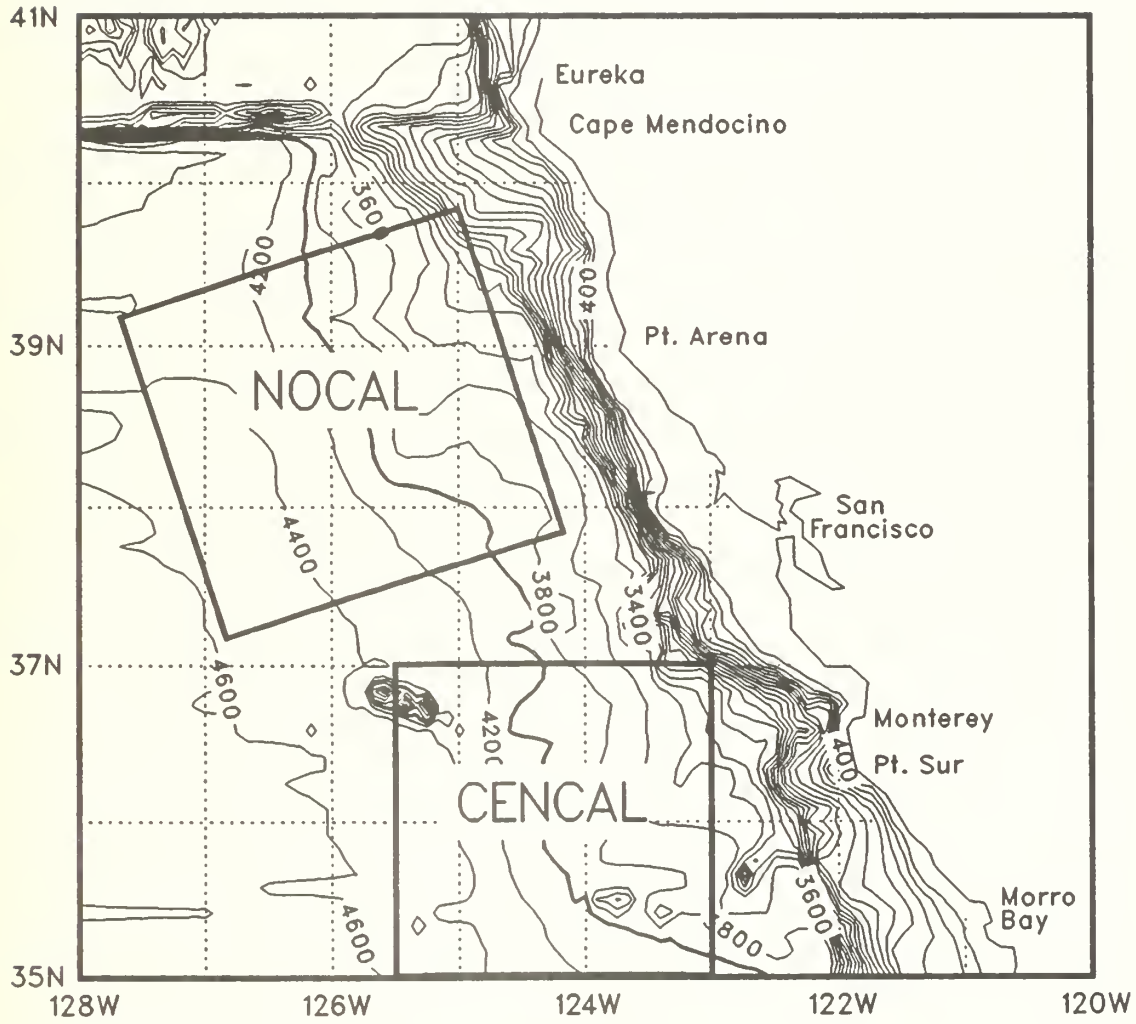

Figure 1: The NOCAL and CENCAL subdomains of the OPTOMA Program. Isobaths are shown in meters.

INTRODUCTION

The OPTOMA (Ocean Prediction Through Observations, Modeling and Analysis) Program, a joint NPS/Harvard program sponsored by ONR, seeks to understand the mesoscale (fronts, eddies, and jets) variability and dynamics of the California Current System and to determine the scientific limits to practical mesoscale ocean forecasting. To help carry out the aims of this project, a series of cruises has been planned in two subdomains, NOCAL and CENCAL, shown in Figure 1.

The two cruises and one AXBT flight comprising OPTOMA15 were undertaken, during January and February 1985, in the USNS DE STEIGUER and a Reserve Patrol Wing P3B aircraft. Hydrographic data were acquired off the coast of California in an area which covered and extended the NOCAL region.

Leg DI was carried out from 24 January to 6 February, Leg P on 27 January and Leg DII from 8 to 23 February. Legs DI and DII sampled an area approximately 300 km square and Leg P sampled an area approximately 260 km square, both areas centered about 190 km off the coast between Pt. Reyes and Pt. Arena.

On each cruise track, transect extremes are identified by letter to aid in cross-referencing the data presented in subsequent figures. On each of these cruises, hydrographic stations were occupied at approximately 19 km along the track. For the AXBT flight, the along-track station spacing varied between about 28 km and about 46 km.

DATA ACQUISITION

Data acquired during Legs DI and DII include XBT and CTD profiles; whereas data acquired during Leg P are AXBT profiles. Bucket surface temperature and water samples for salinity were taken at most CTD stations. A rosette sampler was used on Leg DII to acquire deep salinity samples. These salinity samples

were used for calibration purposes as well as contributions to the data base.

All data were digitized using a Sippican MK9 unit, recorded on data disks using a HP200 series computer, and transferred ashore to the IBM 3033 mainframe computer at the Naval Postgraduate School for editing and processing.

Station positions were determined by Loran C fixes and are claimed to be accurate to within about 0.1 km. Table 1 on page 6 summarizes the various sensors used on the USNS DE STEIGUER and their accuracy. The salinity samples were determined by a Guildline Model 8400 "Autosal" salinometer with an accuracy of $\pm$0.003ppt at the Naval Postgraduate School.

During Leg P, shallow (305 m) and deep (750 m) AXBT's were deployed. The aircraft maintained an altitude of approximately 1500 ft and an airspeed of approximately 170 knots. Station positions are accurate to within 1 km, temperature values to within 0.2°C and depth values to within 2% or 5 m (whichever is larger).

DATA PROCESSING

The data processing, such as estimating depth profiles for the XBT and AXBT temperature profiles based on descent speed, and conversion of CTD conductivity to salinity using the algorithm given in Lewis and Perkin (1981), was carried out on the IBM 3033. The data were then edited by removing obvious salinity spikes and eliminating cast failures that were not identified during the cruise. Approximately 99%, 88%, and 99%, of casts were retained in the data sets of Legs DI, P, and DII, respectively. Two Neil Brown CTD's were used as a result of one having a malfunction. From a comparison of the CTD salinities with the salinity samples from the bottles, it was determined that the first CTD's salinities had an offset of -.015 ppt and the second CTD's salinities had an offset of -.012 ppt. The salinities were adjusted acordingly. The CTD data

were interpolated to 5 m intervals and then up and down casts were averaged.

The data have been transferred on digital tape to the National Oceanographic Data Center in Washington, DC.

DATA PRESENTATION

The cruise track, station locations (with XBT's, CTD's and AXBT's identified) and station numbers are shown in the first three figures of each of the next three sections, which present the data from Legs DI, P, and DII, respectively. These figures are followed by a listing of the stations, with their coordinates, the date and time at which the station was occupied, and the surface information obtained at the station.

Vertical profiles of temperature from the XBT casts are shown in staggered fashion. The location of these profiles may be found by reference to the various maps of the cruise tracks. Transect extremes are identified as nearly as possible. The first profile on each plot is shown with its temperature unchanged; to each subsequent profile an appropriate multiple of 5C has been added. Vertical profiles from the CTD's follow (except Leg P). Profiles of temperature are staggered by 5C and those of salinity by 4 ppt.

Isotherms for each transect are shown in the next pages, followed (except Leg P) by isopleths of temperature, salinity and sigma-t, from the CTD's, when four or more casts were acquired along a transect. Based on instrument accuracy and the vertical temperature gradient, it is estimated that depths of isotherms in the main thermocline are uncertain to $\pm$20m. The tick marks identify station positions and, again, the transect extremes are shown on these plots.

Each section includes mean profiles of temperature from the XBT's. In addition, for Sections 1 and 3, mean profiles of temperature, salinity and sigma-t from the CTD's are given, as well as a scatter diagram of the T-S pairs

and the mean S(T) curve, with the $\pm$ standard deviation envelope; the data presentation concludes with a plot of the mean N^2 (Brunt-Vaisala frequency squared) profile, with $\pm$ the standard deviation. On the sigma-t and N^2 plots, the appropriate profiles derived from the mean temperature and mean salinity profiles are also shown.

Table 1: Scientific instruments aboard the USNS DE STEIGUER

Instrument	Variable	Sensor	Accuracy	Resolution
Neil Brown	pressure	strain gage	1.6 db	0.025 db
CTD	temperature	thermistor	0.005 C	0.0005 C
Mark IIIb	conductivity	electrode cell	0.005 mmho	0.001 mmho
Sippican	temperature	thermistor	0.2 C	
BT	depth	descent speed	greater of 4.6 m and 2% of depth	

Section 1

OPTOMA15 Leg DII

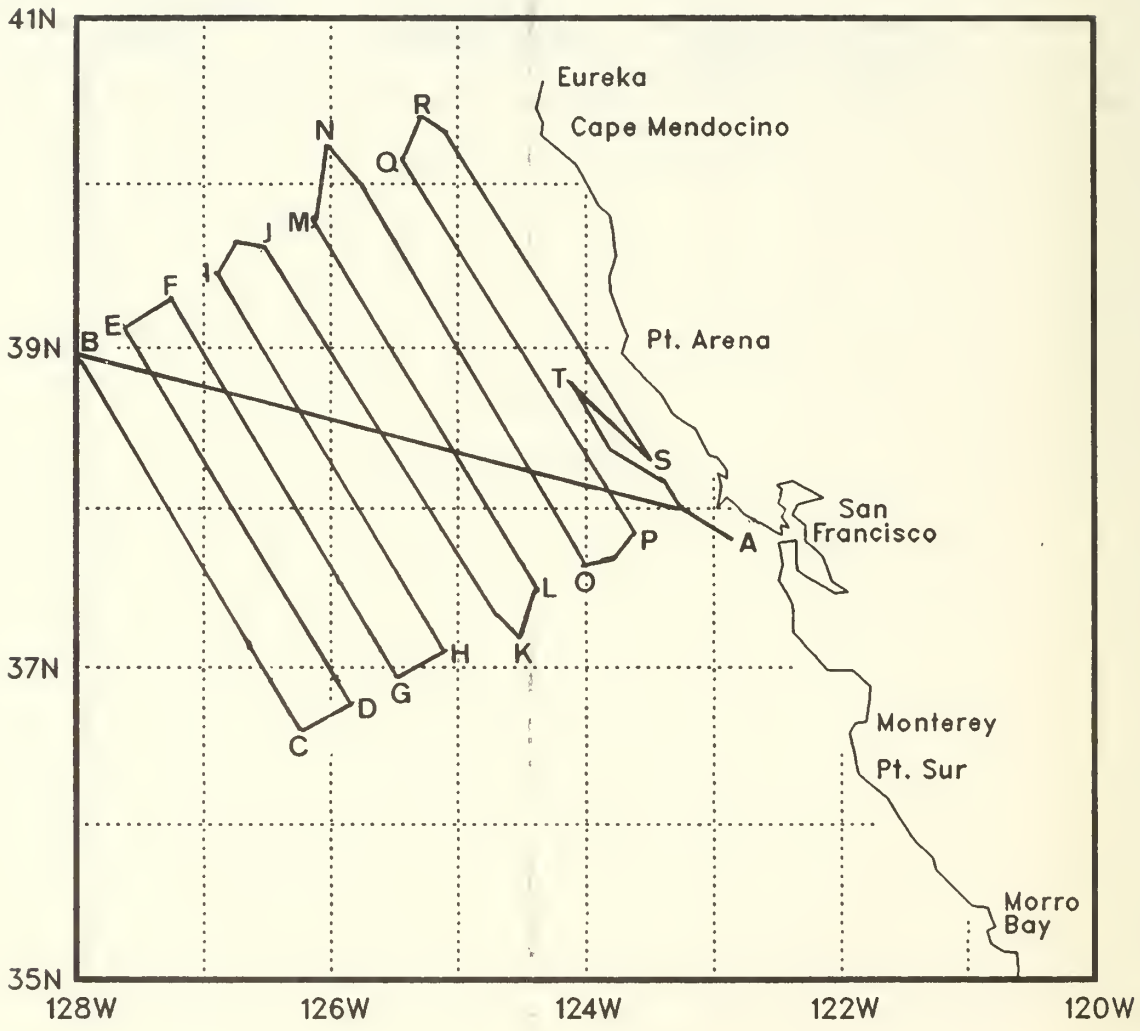

Figure 2: The cruise track for OPTOMA15, Leg DI.

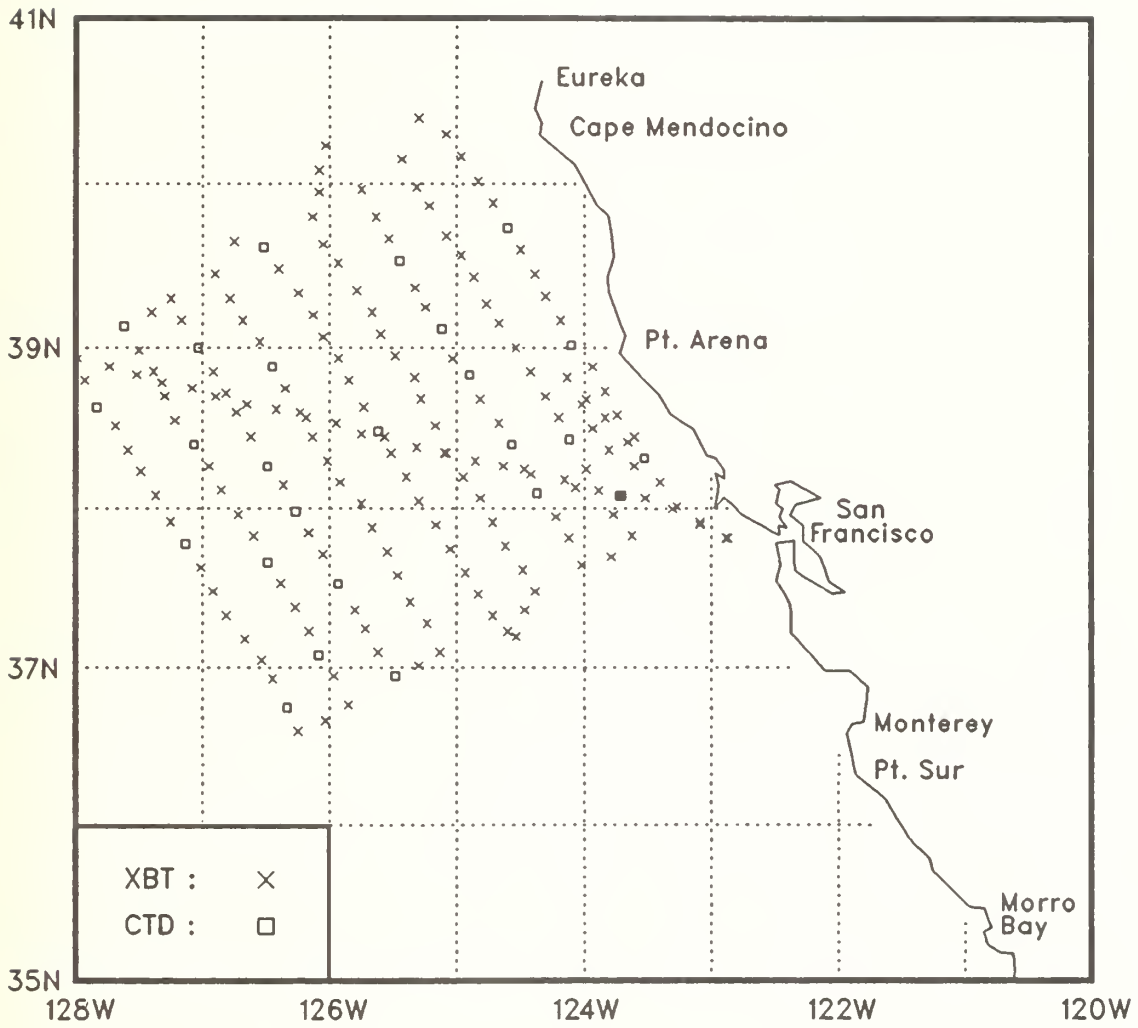

Figure 3: XBT and CTD locations for OPTOMA15, Leg DI.

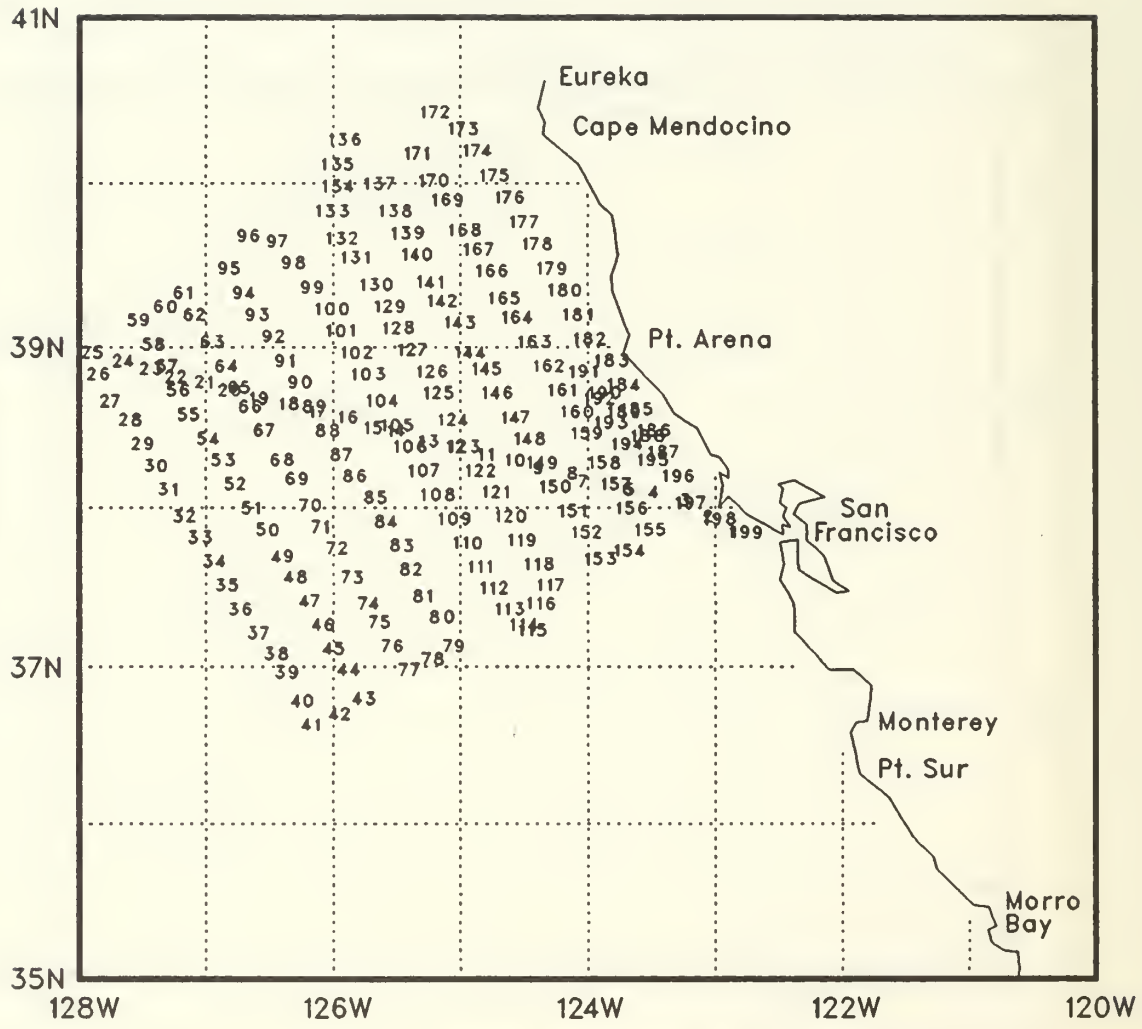

Figure 4: Station numbers for OPTOMA15, Leg DI.

Table 2: Leg DI Station Listing

STN	TYPE	YR/DAY	GMT	LAT (NORTH) (DD.MM)	LONG (WEST) (DDD.MM)	SURFACE TEMP (DEG C)	SURFACE SALINITY (PPT)	BUCKET TEMP (DEG C)	BOTTLE SALINITY (PPT)
1	XBT	85025	357	37.49	122.53	11.0			
2	XBT	85025	456	37.55	123.05	11.6			
3	XBT	85025	557	38.01	123.16	12.1			
4	XBT	85025	707	38.04	123.31	12.2			
5	XBT	85025	810	38.05	123.42	12.0			
6	CTD	85025	952	38.05	123.43	12.1	33.11	12.2	33.14
7	XBT	85025	1136	38.08	124.04	12.3			
8	XBT	85025	1236	38.11	124.09	12.1			
9	XBT	85025	1344	38.13	124.25	12.2			
10	XBT	85025	1439	38.16	124.38	11.8			
11	XBT	85025	1538	38.18	124.51	11.8			
12	XBT	85025	1621	38.21	125.06	11.8			
13	XBT	85025	1752	38.23	125.19	12.1			
14	XBT	85025	1905	38.27	125.34	12.1			
15	XBT	85025	2013	38.28	125.45	12.2			
16	XBT	85025	2114	38.32	125.57	12.1			
17	XBT	85025	2222	38.34	126.11	11.9			
18	XBT	85025	2327	38.37	126.25	12.4			
19	XBT	85026	30	38.39	126.39	12.1			
20	XBT	85026	131	38.42	126.54	12.2			
21	XBT	85026	231	38.45	127.05	12.3			
22	XBT	85026	335	38.47	127.19	12.6			
23	XBT	85026	432	38.50	127.31	12.4			
24	XBT	85026	532	38.53	127.44	12.5			
25	XBT	85026	640	38.56	127.59	13.2			
26	XBT	85026	738	38.48	127.56	12.1			
27	CTD	85026	907	38.38	127.50	12.3	32.74	12.1	32.74
28	XBT	85026	1027	38.31	127.41	12.0			
29	XBT	85026	1126	38.22	127.35	12.0			
30	XBT	85026	1231	38.14	127.29	12.1			
31	XBT	85026	1323	38.05	127.22	12.0			
32	XBT	85026	1431	37.55	127.15	12.1			
33	CTD	85026	1627	37.47	127.08	11.7	32.99	11.7	33.00
34	XBT	85026	1821	37.38	127.01	12.1			
35	XBT	85026	1922	37.29	126.55	12.0			
36	XBT	85026	2016	37.20	126.49	12.3			
37	XBT	85026	2111	37.11	126.40	13.7			
38	XBT	85026	2202	37.03	126.32	14.2			
39	XBT	85026	2252	36.56	126.27	14.4			
40	CTD	85027	23	36.45	126.20	14.5	33.26	12.0	33.33
41	XBT	85027	143	36.36	126.15	14.4			
42	XBT	85027	247	36.40	126.02	14.5			
43	XBT	85027	353	36.46	125.51	13.6			
44	XBT	85027	513	36.57	125.58	14.3			
45	CTD	85027	640	37.05	126.05	14.0	33.14	13.8	33.28

STN	TYPE	YR/DAY	GMT	LAT (NORTH) (DD.MM)	LONG (WEST) (DDD.MM)	SURFACE TEMP (DEG C)	SURFACE SALINITY (PPT)	BUCKET TEMP (DEG C)	BOTTLE SALINITY (PPT)
46	XBT	85027	825	37.14	126.10	11.9			
47	XBT	85027	935	37.23	126.16	12.0			
48	XBT	85027	1047	37.32	126.23	11.7			
49	CTD	85027	1235	37.40	126.29	11.8	32.97	12.0	32.98
50	XBT	85027	1425	37.50	126.36	11.9			
51	XBT	85027	1517	37.58	126.43	11.7			
52	XBT	85027	1619	38.07	126.51	12.1			
53	XBT	85027	1725	38.16	126.57	12.3			
54	CTD	85027	1857	38.24	127.04	12.0	33.04	12.2	32.97
55	XBT	85027	2027	38.33	127.13	12.1			
56	XBT	85027	2130	38.42	127.18	12.3			
57	XBT	85027	2338	38.51	127.23	12.4			
58	XBT	85028	33	38.59	127.30	12.5			
59	CTD	85028	210	39.08	127.37	12.3	32.70	12.2	32.51
60	XBT	85028	400	39.13	127.24	12.3			
61	XBT	85028	444	39.18	127.15	12.4			
62	XBT	85028	539	39.10	127.10	12.4			
63	CTD	85028	743	39.00	127.02	12.2	32.71	12.5	32.60
64	XBT	85028	943	38.51	126.55	12.4			
65	XBT	85028	1038	38.43	126.49	12.4			
66	XBT	85028	1135	38.36	126.44	12.1			
67	XBT	85028	1239	38.27	126.37	12.0			
68	CTD	85028	1356	38.16	126.29	11.8	32.95	11.9	32.94
69	XBT	85028	1635	38.09	126.22	12.1			
70	CTD	85028	1958	37.59	126.16	12.0	33.00	12.2	33.03
71	XBT	85028	2211	37.51	126.10	11.7			
72	XBT	85028	2300	37.43	126.03	11.7			
73	CTD	85029	113	37.32	125.56	11.6	32.88	11.9	32.90
74	XBT	85029	319	37.22	125.48	11.9			
75	XBT	85029	402	37.15	125.43	11.9			
76	XBT	85029	453	37.06	125.37	11.9			
77	CTD	85029	651	36.57	125.29	12.1	32.78	12.2	32.82
78	XBT	85029	902	37.01	125.18	11.7			
79	XBT	85029	1002	37.06	125.08	11.6			
80	XBT	85029	1142	37.17	125.14	11.6			
81	XBT	85029	1339	37.25	125.22	11.7			
82	XBT	85029	1531	37.35	125.28	11.9			
83	XBT	85029	1657	37.44	125.33	12.1			
84	XBT	85029	1819	37.53	125.40	11.9			
85	XBT	85029	1957	38.02	125.45	12.0			
86	XBT	85029	2133	38.10	125.55	12.0			
87	XBT	85029	2253	38.18	126.01	11.7			
88	XBT	85030	24	38.27	126.08	11.8			
89	XBT	85030	138	38.36	126.14	12.4			
90	XBT	85030	332	38.45	126.21	12.3			

STN	TYPE	YR/DAY	GMT	LAT (NORTH) (DD.MM)	LONG (WEST) (DDD.MM)	SURFACE TEMP (DEG C)	SURFACE SALINITY (PPT)	BUCKET TEMP (DEG C)	BOTTLE SALINITY (PPT)
91	CTD	85030	518	38.53	126.27	12.3	32.83	12.0	32.84
92	XBT	85030	726	39.02	126.33	12.1			
93	XBT	85030	909	39.10	126.41	12.2			
94	XBT	85030	1106	39.18	126.47	12.3			
95	XBT	85030	1252	39.27	126.54	12.0			
96	XBT	85030	1536	39.39	126.45	12.5			
97	CTD	85030	1821	39.37	126.31	12.5	32.84	12.6	32.86
98	XBT	85030	1947	39.29	126.24	12.4			
99	XBT	85030	2050	39.20	126.15	12.2			
100	XBT	85030	2144	39.12	126.08	12.2			
101	XBT	85030	2235	39.04	126.03	12.2			
102	XBT	85030	2333	38.56	125.56	12.1			
103	XBT	85031	29	38.48	125.51	12.1			
104	XBT	85031	131	38.38	125.44	12.1			
105	CTD	85031	402	38.29	125.37	11.6	33.11	11.7	33.13
106	XBT	85031	522	38.21	125.31	11.9			
107	XBT	85031	626	38.12	125.24	11.5			
108	XBT	85031	734	38.03	125.18	11.8			
109	XBT	85031	859	37.54	125.10	11.9			
110	XBT	85031	1019	37.45	125.03	11.9			
111	XBT	85031	1135	37.36	124.56	11.8			
112	XBT	85031	1238	37.28	124.50	11.9			
113	XBT	85031	1344	37.20	124.43	11.9			
114	XBT	85031	1443	37.14	124.36	12.2			
115	XBT	85031	1544	37.12	124.32	12.2			
116	XBT	85031	1819	37.22	124.28	12.1			
117	XBT	85031	1946	37.29	124.23	12.5			
118	XBT	85031	2205	37.37	124.29	12.0			
119	XBT	85032	43	37.46	124.37	11.9			
120	XBT	85032	306	37.55	124.43	12.0			
121	XBT	85032	539	38.04	124.49	12.0			
122	XBT	85032	800	38.12	124.57	11.9			
123	XBT	85032	1011	38.21	125.05	11.7			
124	XBT	85032	1223	38.31	125.10	11.6			
125	XBT	85032	1442	38.41	125.17	11.7			
126	XBT	85032	1614	38.49	125.20	11.7			
127	XBT	85032	1750	38.57	125.29	11.8			
128	XBT	85032	1933	39.05	125.36	11.9			
129	XBT	85032	2142	39.13	125.40	11.8			
130	XBT	85032	2346	39.21	125.47	11.9			
131	XBT	85033	246	39.31	125.56	11.7			
132	XBT	85033	606	39.38	126.03	11.8			
133	XBT	85033	910	39.48	126.08	11.7			
134	XBT	85033	1121	39.57	126.05	11.8			
135	XBT	85033	1315	40.05	126.05	11.7			

STN	TYPE	YR/DAY	GMT	LAT (NORTH) (DD.MM)	LONG (WEST) (DDD.MM)	SURFACE TEMP (DEG C)	SURFACE SALINITY (PPT)	BUCKET TEMP (DEG C)	BOTTLE SALINITY (PPT)
136	XBT	85033	1523	40.14	126.02	11.8			
137	XBT	85033	1725	39.58	125.45	11.6			
138	XBT	85033	1827	39.48	125.38	11.9			
139	XBT	85033	1916	39.40	125.32	11.7			
140	CTD	85033	2046	39.32	125.27	11.5	32.76	11.5	32.82
141	XBT	85033	2211	39.22	125.20	11.5			
142	XBT	85033	2258	39.15	125.15	11.5			
143	CTD	85034	14	39.07	125.07	11.6	32.88	11.7	32.96
144	XBT	85034	205	38.56	125.02	11.7			
145	CTD	85034	309	38.50	124.54	11.5	33.22	11.5	33.28
146	XBT	85034	548	38.41	124.49	11.6			
147	XBT	85034	659	38.32	124.40	11.7			
148	CTD	85034	836	38.24	124.34	11.4	33.21	11.8	33.24
149	XBT	85034	1025	38.15	124.28	11.6			
150	CTD	85034	1200	38.06	124.22	11.7	33.30	11.8	33.33
151	XBT	85034	1347	37.57	124.13	12.0			
152	XBT	85034	1443	37.49	124.07	11.6			
153	XBT	85034	1547	37.39	124.01	11.8			
154	XBT	85034	1705	37.42	123.47	11.6			
155	XBT	85034	1811	37.50	123.37	11.7			
156	XBT	85034	1922	37.58	123.46	11.7			
157	XBT	85034	2033	38.07	123.53	11.5			
158	XBT	85034	2132	38.15	123.59	11.5			
159	CTD	85034	2255	38.26	124.07	11.7	33.29	11.6	33.35
160	XBT	85035	217	38.34	124.12	11.6			
161	XBT	85035	346	38.42	124.18	11.5			
162	XBT	85035	522	38.51	124.25	11.2			
163	XBT	85035	713	39.00	124.32	11.5			
164	XBT	85035	925	39.09	124.40	11.4			
165	XBT	85035	1127	39.16	124.46	11.6			
166	XBT	85035	1414	39.26	124.52	10.9			
167	XBT	85035	1633	39.34	124.58	10.8			
168	XBT	85035	1830	39.41	125.05	10.7			
169	XBT	85035	2036	39.52	125.13	10.9			
170	XBT	85035	2202	39.59	125.19	10.9			
171	XBT	85035	2338	40.09	125.26	11.1			
172	XBT	85036	238	40.24	125.18	10.9			
173	XBT	85036	443	40.18	125.05	10.7			
174	XBT	85036	544	40.10	124.58	10.5			
175	XBT	85036	643	40.01	124.50	10.6			
176	XBT	85036	746	39.53	124.43	10.5			
177	CTD	85036	914	39.44	124.36	10.6	32.93	10.5	33.03
178	XBT	85036	1056	39.36	124.30	10.6			
179	XBT	85036	1150	39.27	124.23	11.1			
180	XBT	85036	1244	39.19	124.18	11.3			

STN	TYPE	YR/DAY	GMT	LAT (NORTH) (DD.MM)	LONG (WEST) (DDD.MM)	SURFACE TEMP (DEG C)	SURFACE SALINITY (PPT)	BUCKET TEMP (DEG C)	BOTTLE SALINITY (PPT)
181	XBT	85036	1340	39.10	124.11	11.1			
182	CTD	85036	1515	39.01	124.06	11.2	32.83	11.0	33.13
183	XBT	85036	1636	38.53	123.56	10.9			
184	XBT	85036	1719	38.44	123.50	10.6			
185	XBT	85036	1816	38.35	123.44	10.8			
186	XBT	85036	1911	38.27	123.36	10.9			
187	CTD	85036	2010	38.19	123.31	11.0	33.11	10.9	33.88
188	XBT	85036	2127	38.25	123.39	10.9			
189	XBT	85036	2255	38.34	123.50	11.1			
190	XBT	85037	12	38.41	123.59	11.2			
191	XBT	85037	135	38.49	124.08	11.3			
192	XBT	85037	248	38.39	124.01	11.3			
193	XBT	85037	340	38.30	123.56	10.9			
194	XBT	85037	446	38.22	123.48	11.1			
195	XBT	85037	556	38.16	123.36	11.0			
196	XBT	85037	651	38.10	123.24	11.3			
197	XBT	85037	838	38.00	123.18	11.4			
198	XBT	85037	1106	37.54	123.05	11.3			
199	XBT	85037	1240	37.49	122.52	11.4			

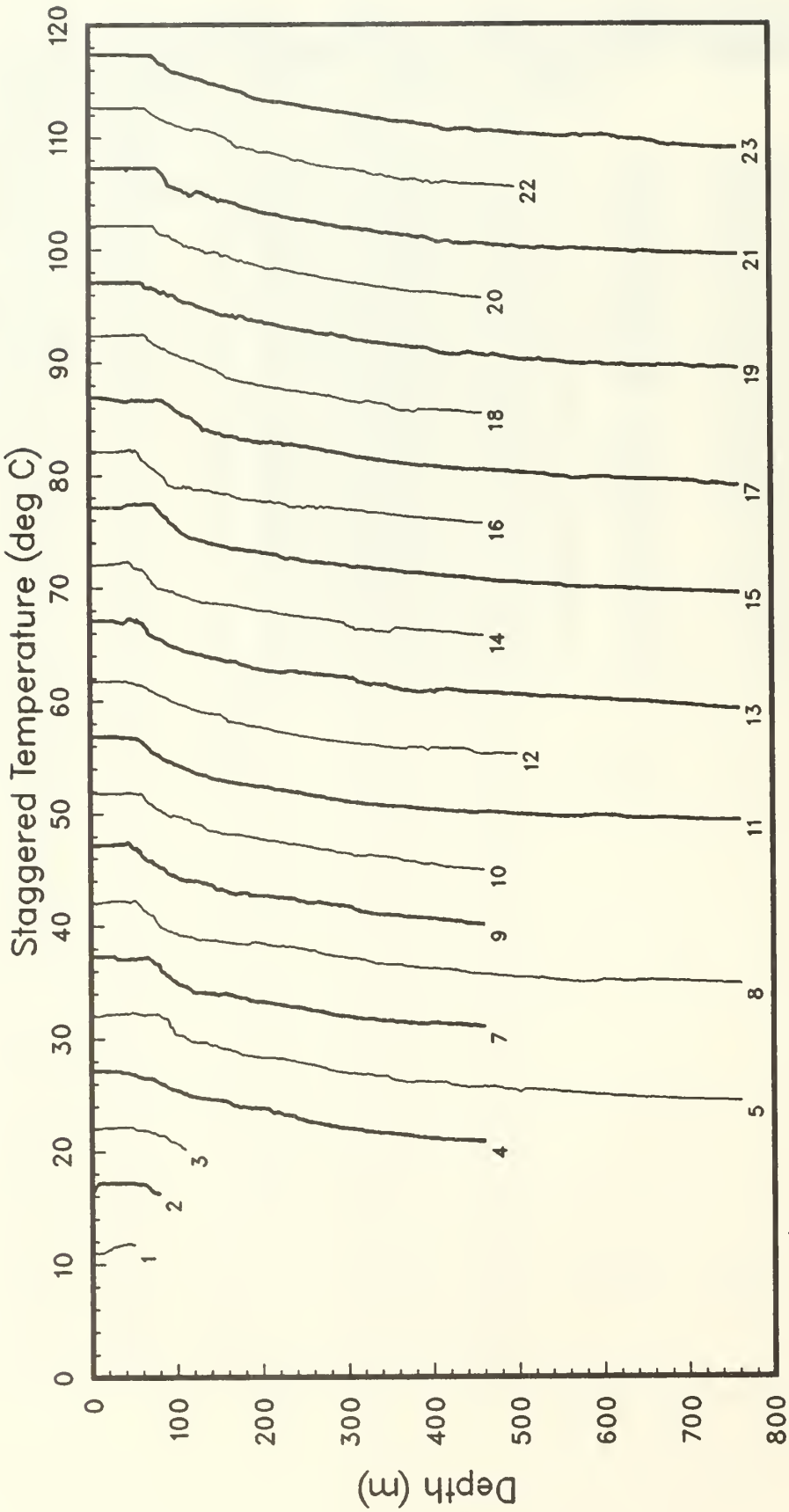

Figure 5(a): XBT temperature profiles, staggered by multiples of 5C (OPTOMA15, Leg DI).

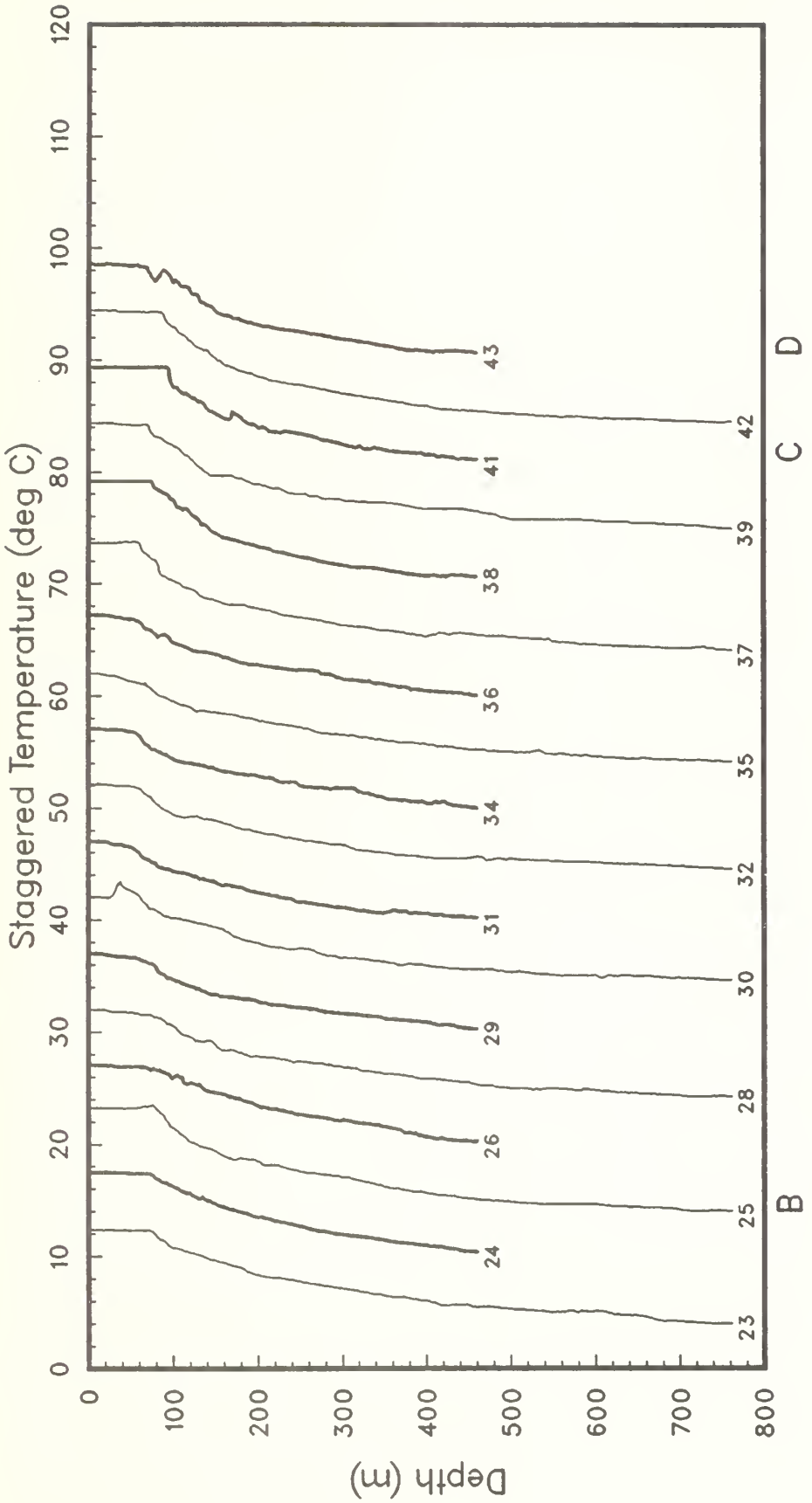
Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (m)
0
100
200
300
400
500
600
700
800
23
24
25
26
28
29
30
31
32
34
35
36
37
38
39
41
42
43
B
C
D

Figure 5(b)

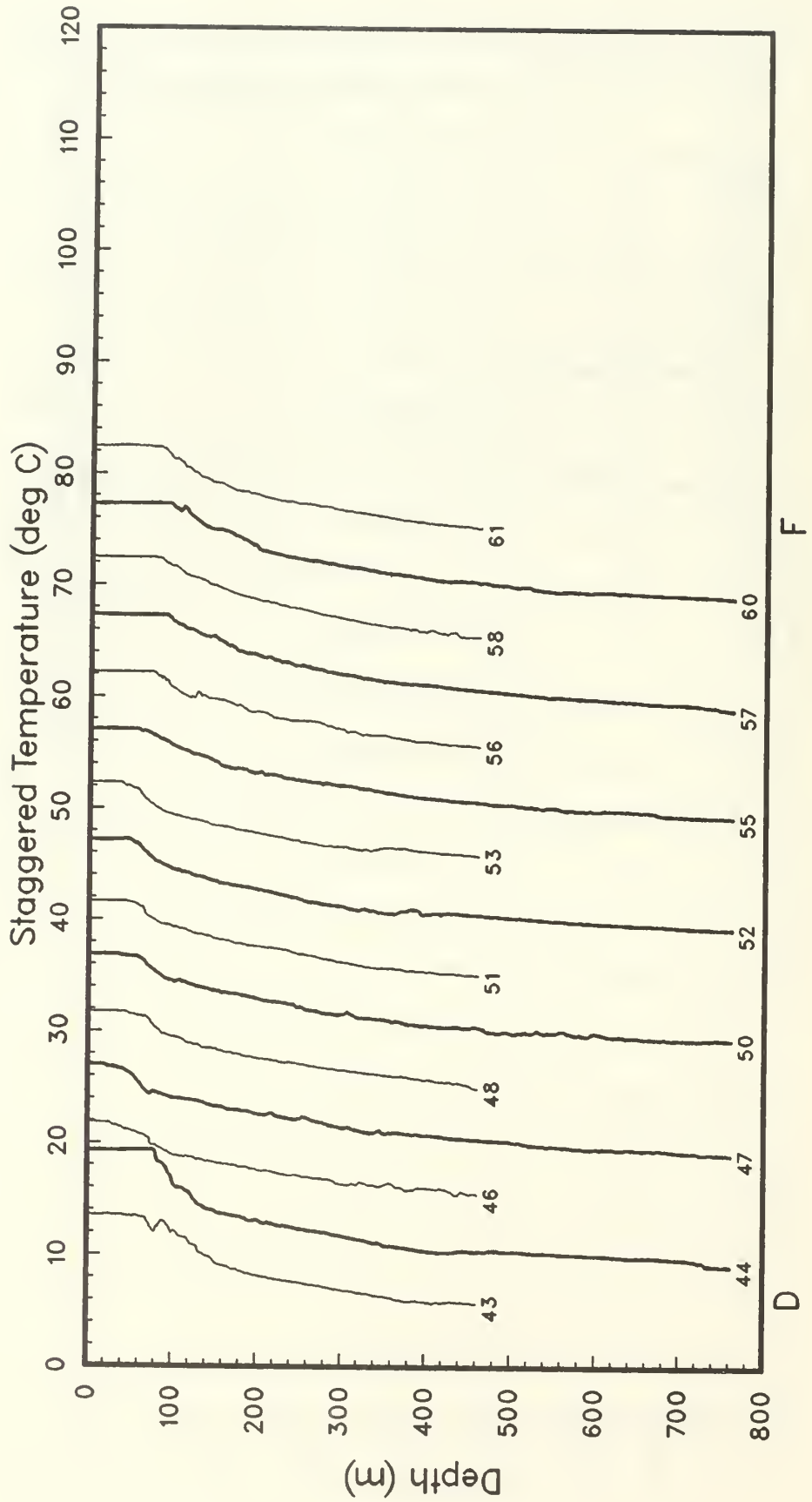
Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (m)
0
100
200
300
400
500
600
700
800
43
44
46
47
48
50
51
52
53
55
56
57
58
60
61
D
F

Figure 5(c)

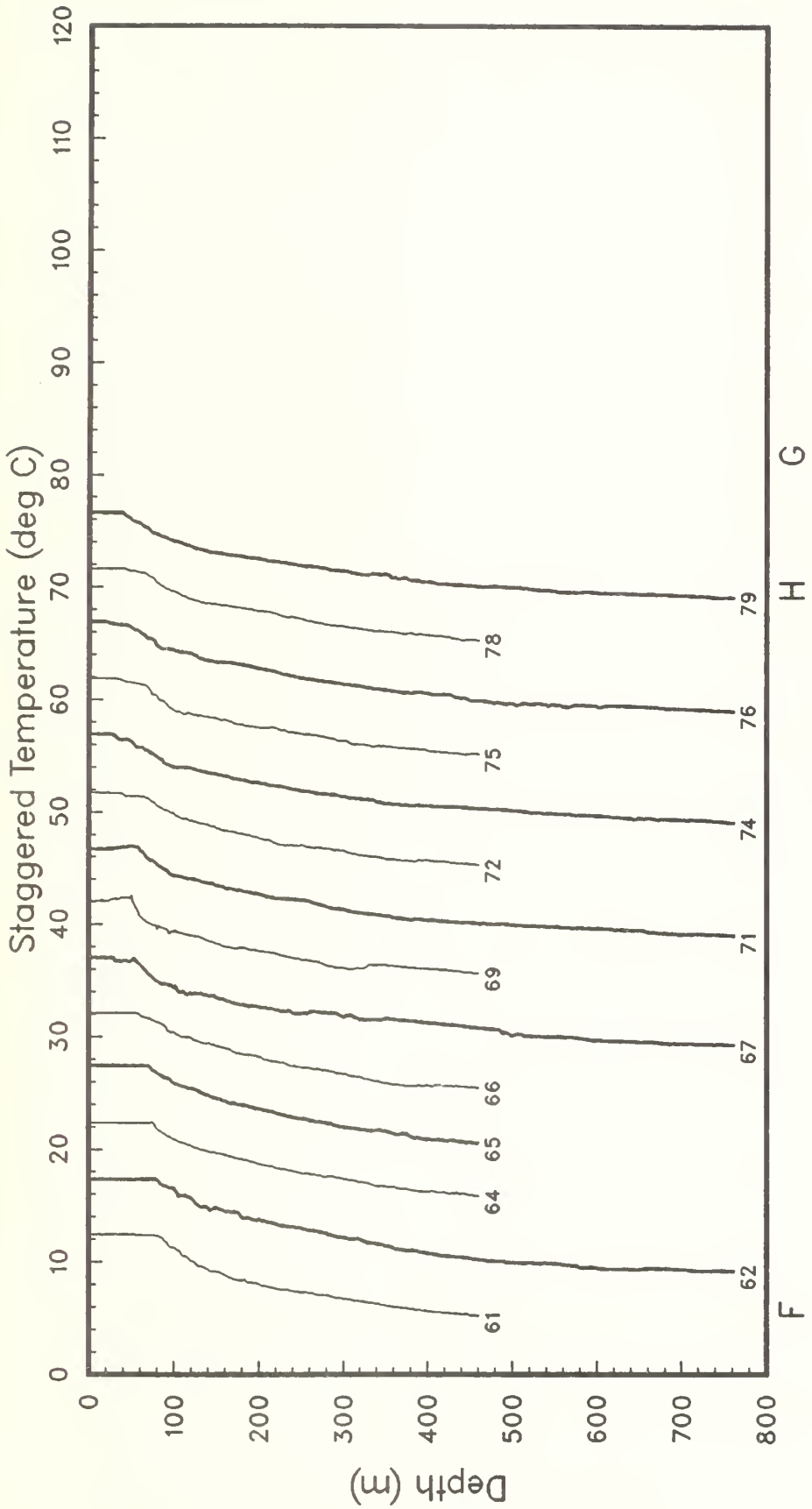
Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (m)
0
100
200
300
400
500
600
700
800
61
62
64
65
66
67
69
71
72
74
75
76
78
79
F
G
H

Figure 5(d)

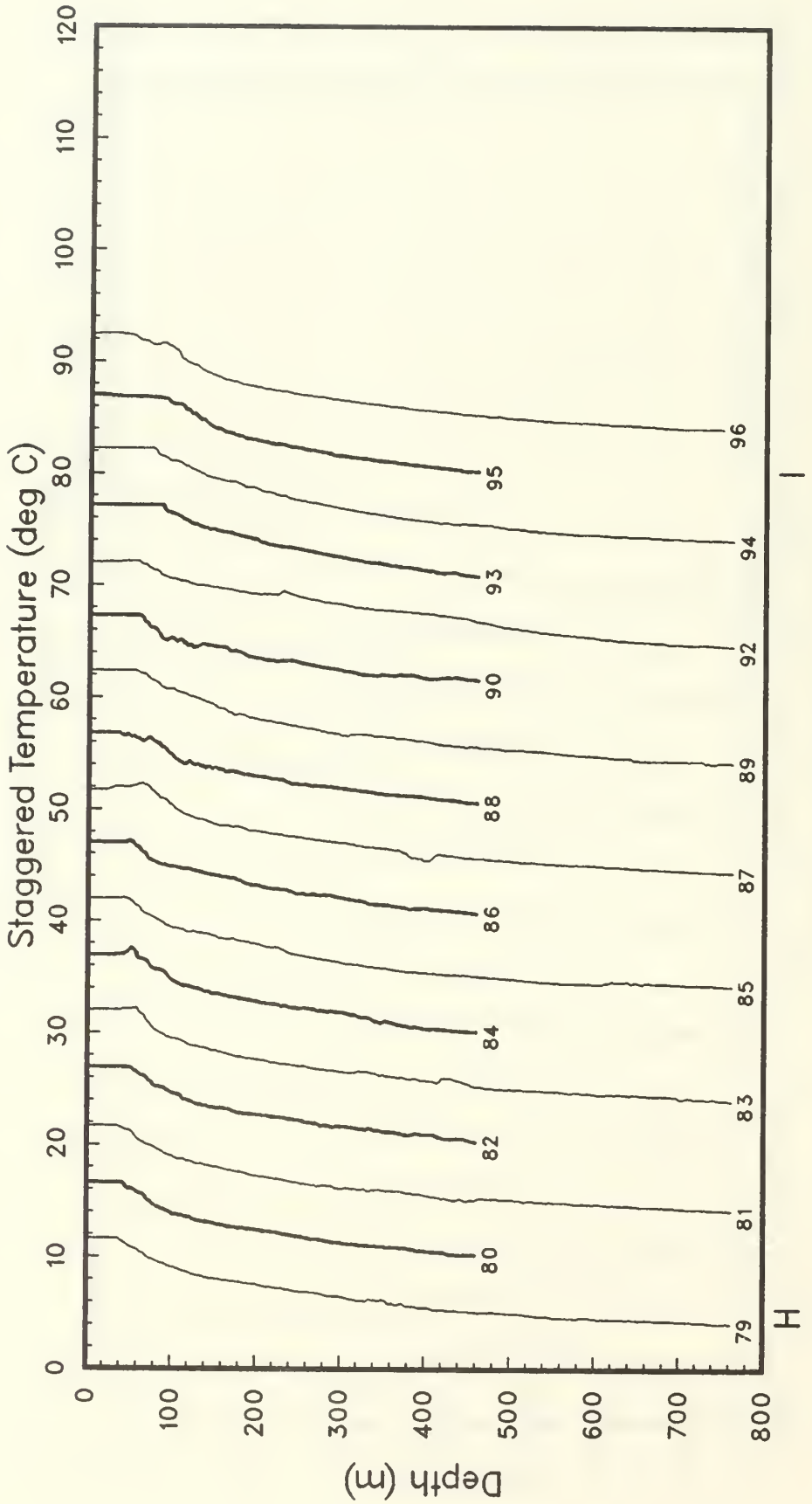
Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (m)
0
100
200
300
400
500
600
700
800
79
80
81
82
83
84
85
86
87
88
89
90
92
93
94
95
96
H
I

Figure 5(e)

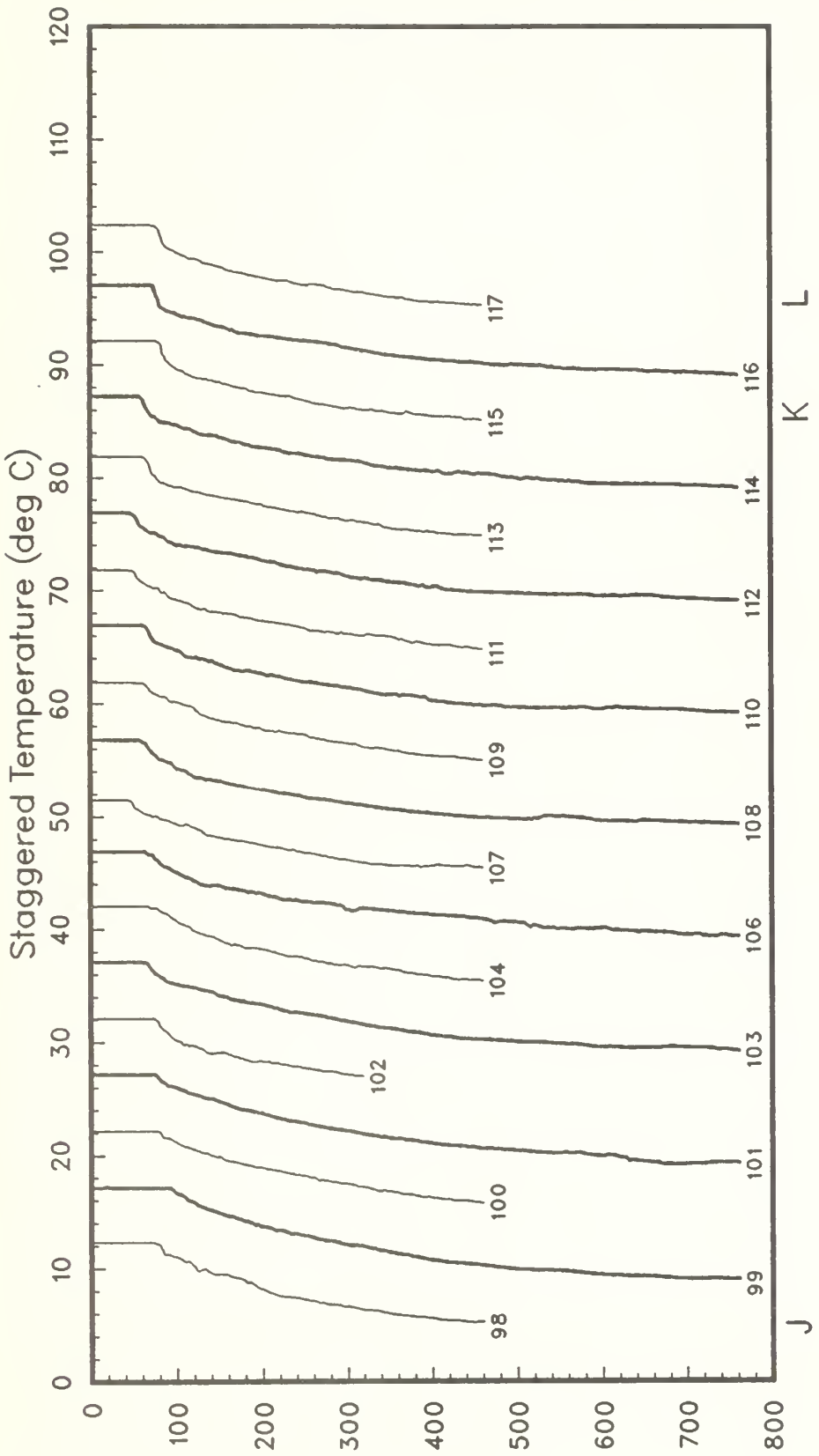
Staggered Temperature (deg C)
Depth (m)
0
10
20
30
40
50
60
70
80
90
100
110
120
0
100
200
300
400
500
600
700
800
98
99
100
101
102
103
104
106
107
108
109
110
111
112
113
114
115
116
117
J
K
L

Figure 5(f)

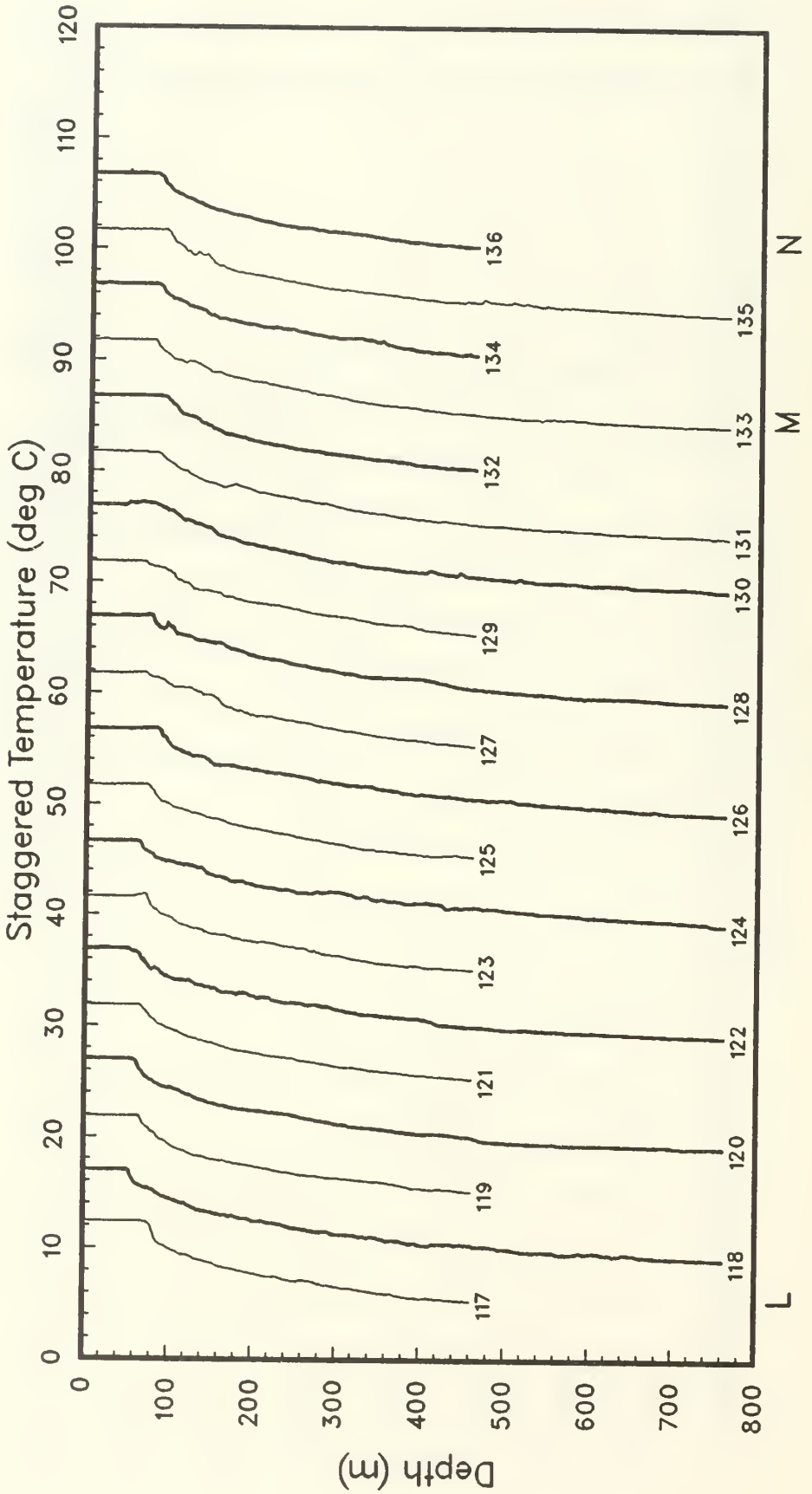
Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (m)
0
100
200
300
400
500
600
700
800
117
118
119
120
121
122
123
124
125
126
127
128
129
130
131
132
133
134
135
136
L
M
N

Figure 5(g)

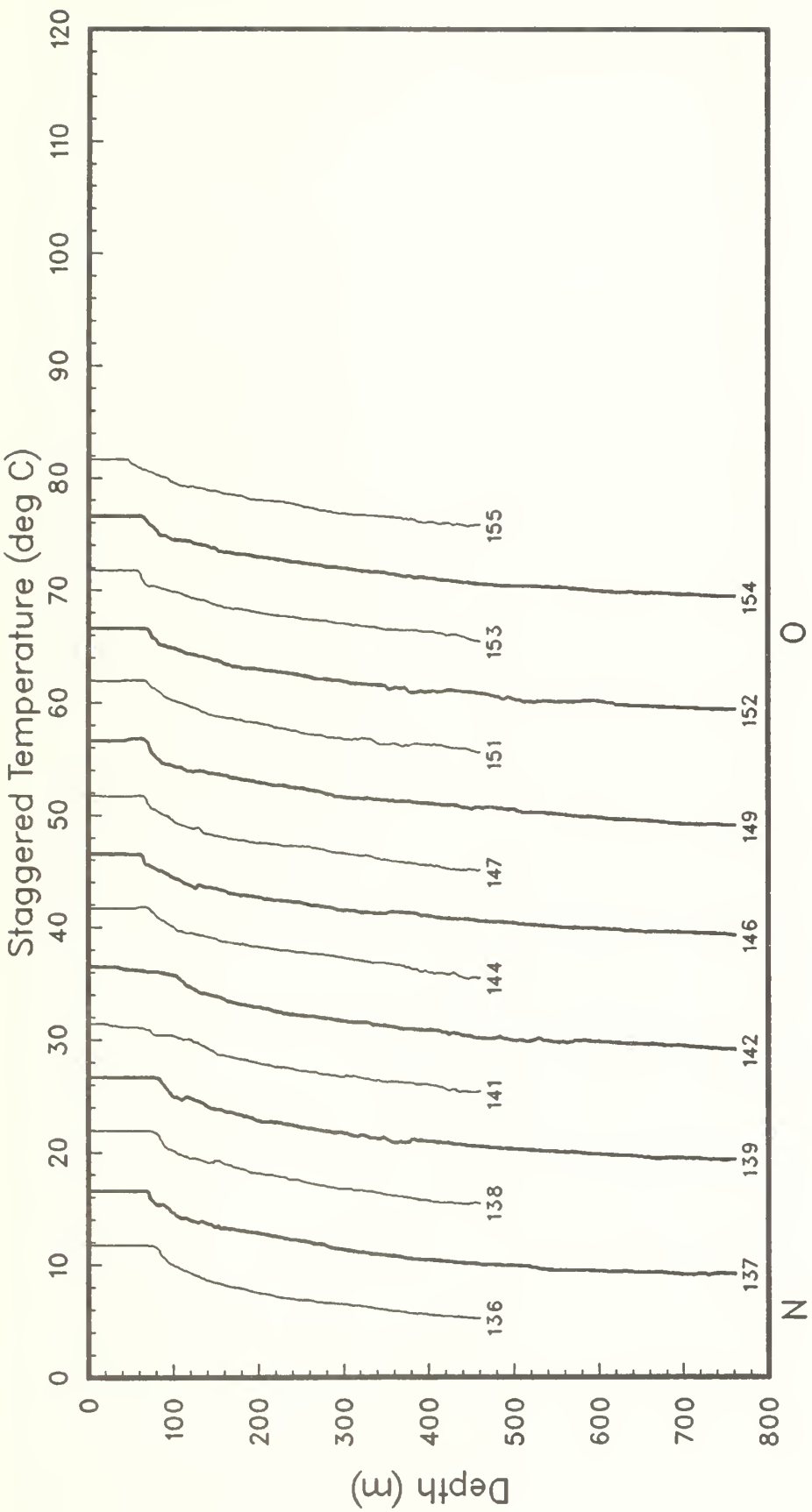
Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (m)
0
100
200
300
400
500
600
700
800
136
137
138
139
141
142
144
146
147
149
151
152
153
154
155
N
O

Figure 5(h)

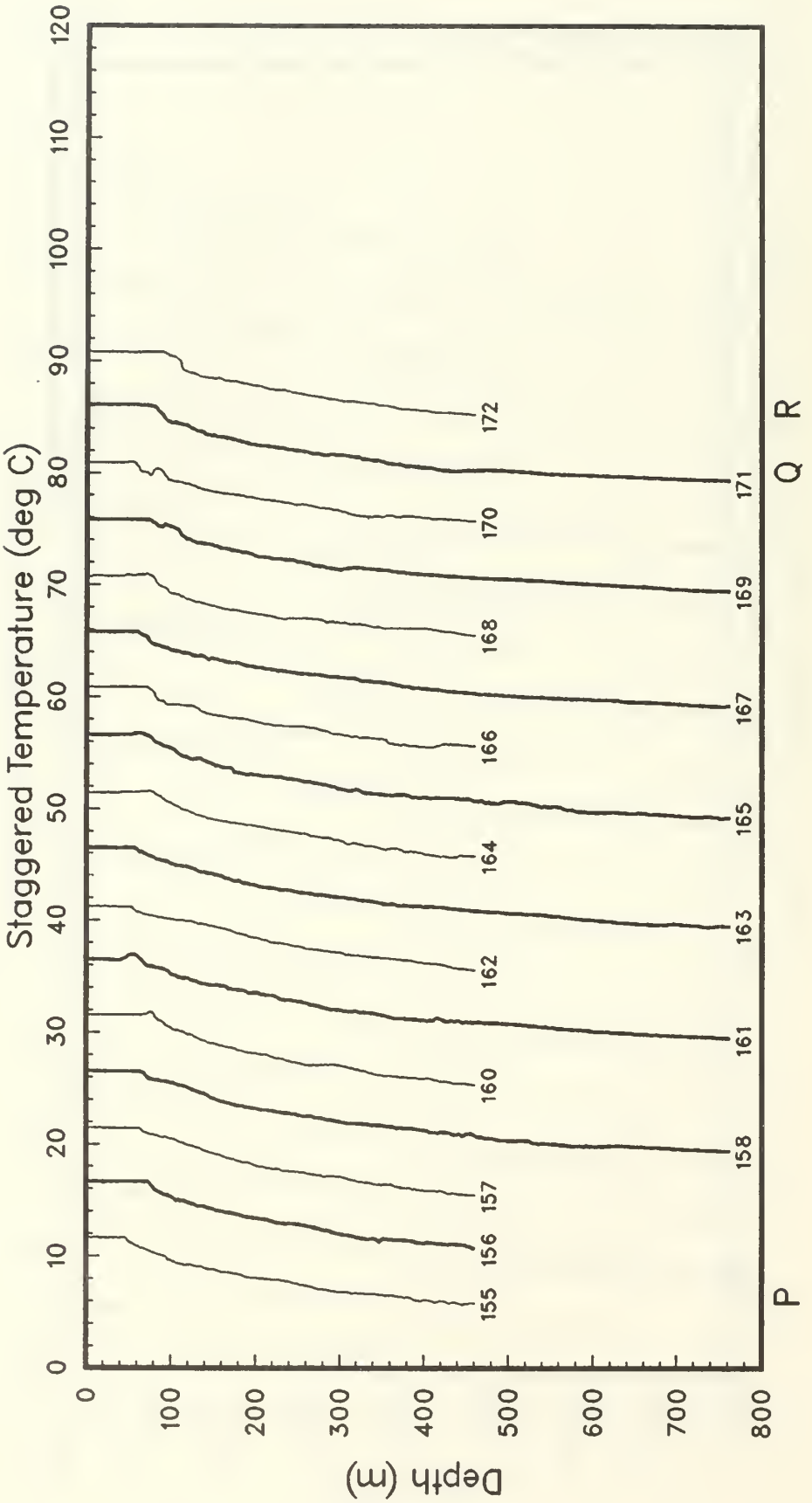
Staggered Temperature (deg C)
Depth (m)
0
10
20
30
40
50
60
70
80
90
100
110
120
0
100
200
300
400
500
600
700
800
155
156
157
158
160
161
162
163
164
165
166
167
168
169
170
171
172
P
Q
R

Figure 5(i)

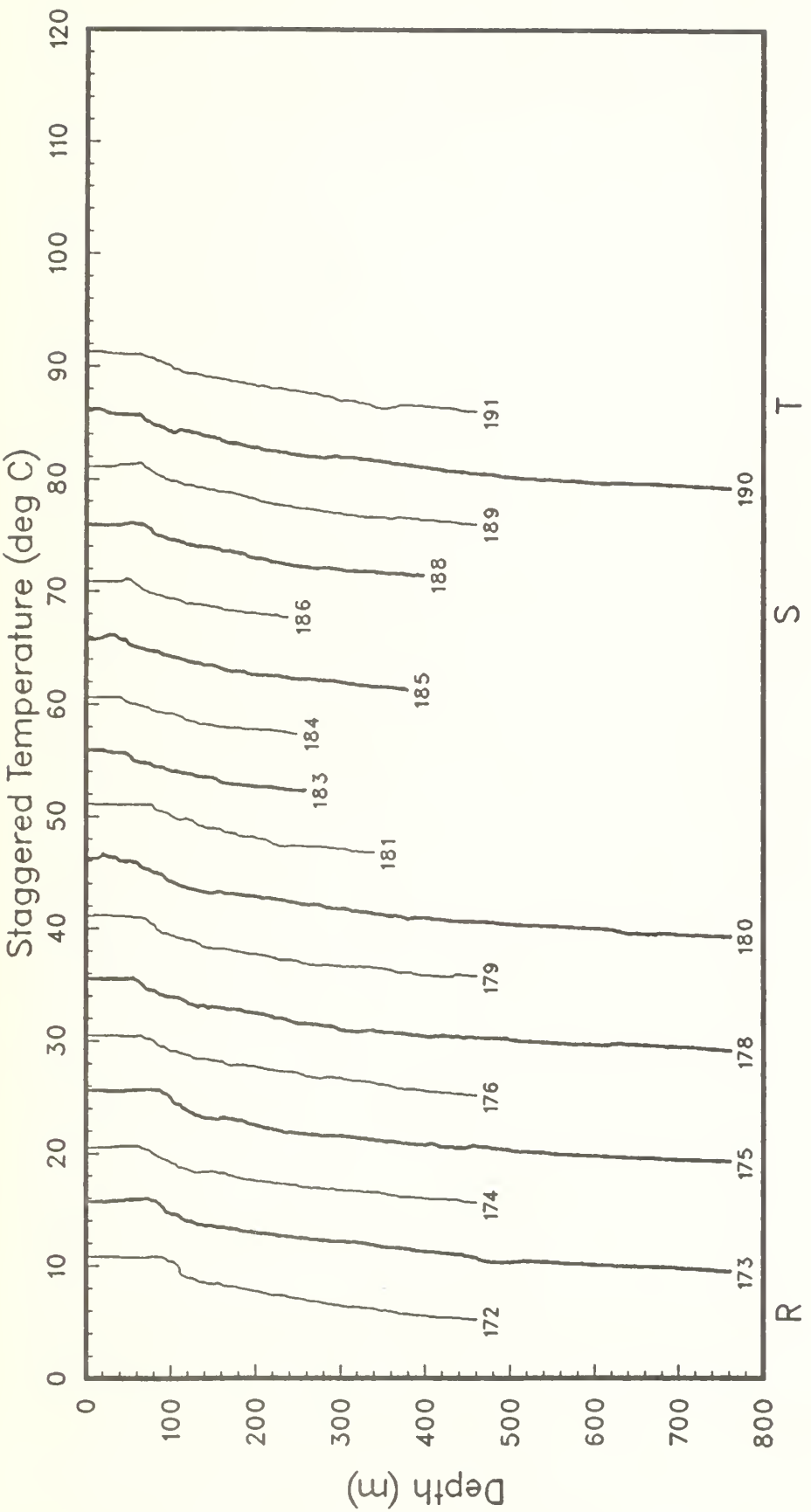
Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (m)
0
100
200
300
400
500
600
700
800
R
S
T
172
173
174
175
176
178
179
180
181
183
184
185
186
188
189
190
191

Figure 5(j)

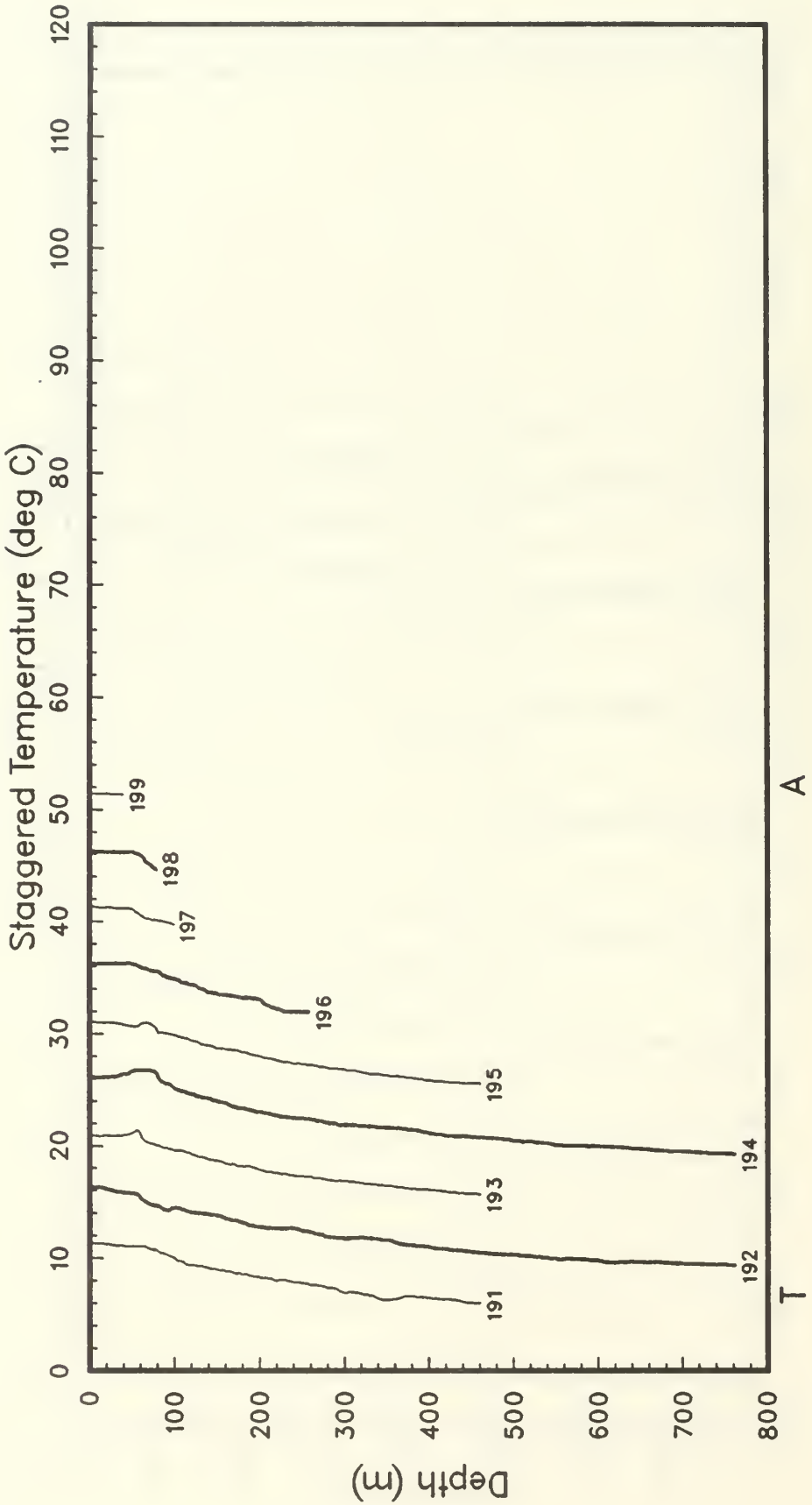
Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (m)
0
100
200
300
400
500
600
700
800
191
192
193
194
195
196
197
198
199
T
A

Figure 5(k)

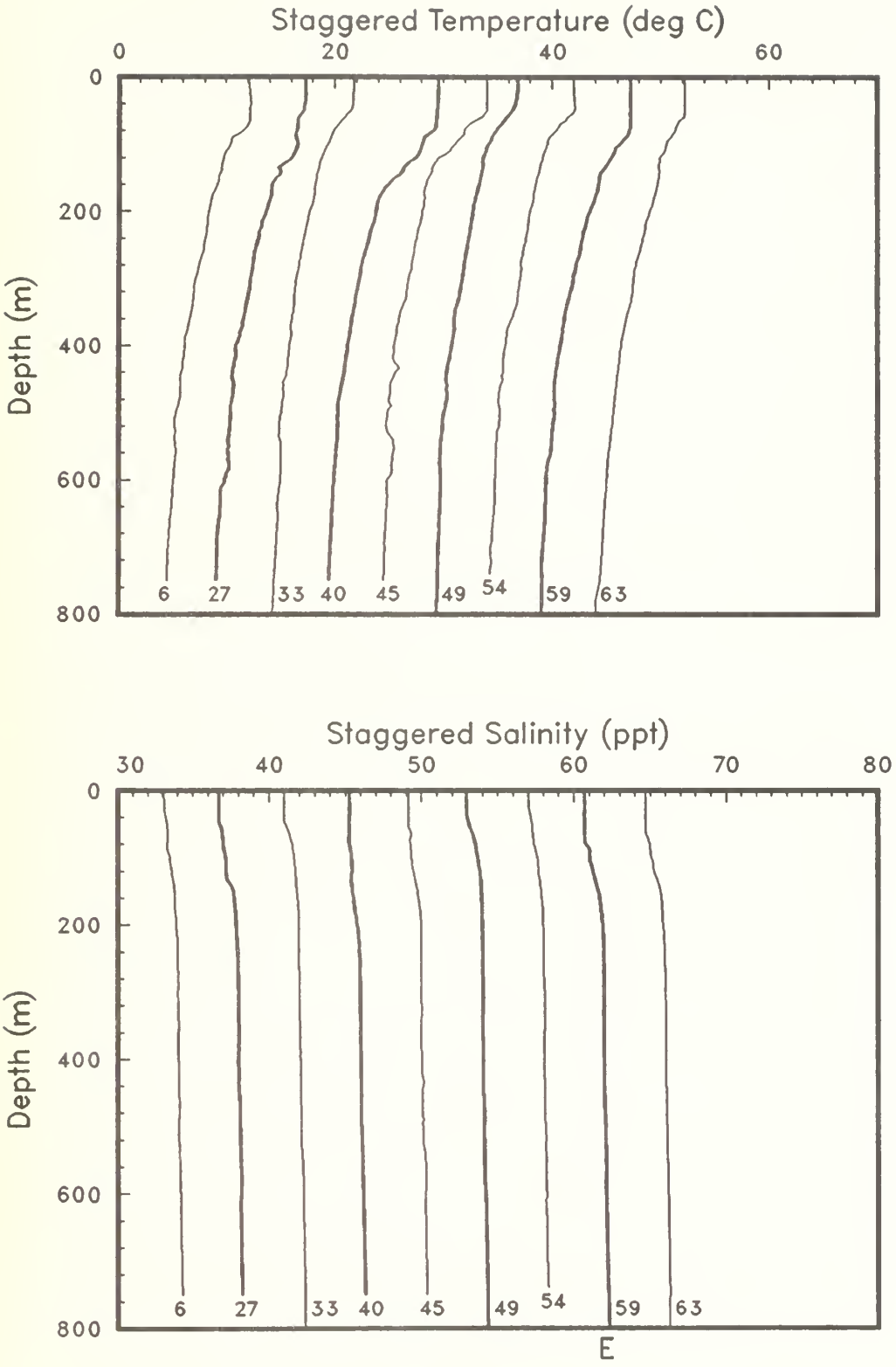

Figure 6(a): CTD temperature profiles, staggered by multiples of 5C, and salinity profiles, staggered by multiples of 4ppt (OPTOMA15, Leg DI).

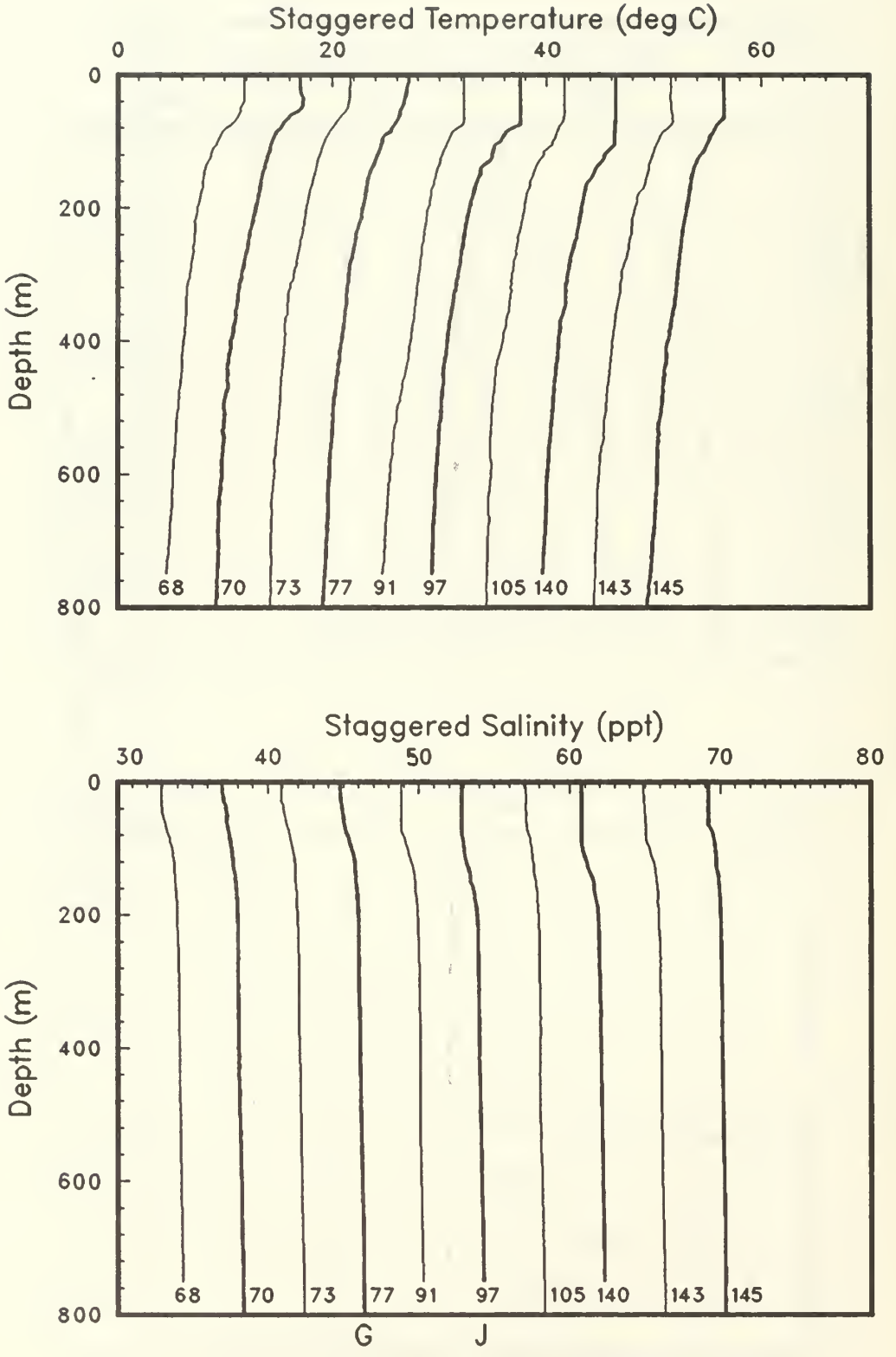
Staggered Temperature (deg C)
0
20
40
60
Depth (m)
0
200
400
600
800
68
70
73
77
91
97
105
140
143
145
Staggered Salinity (ppt)
30
40
50
60
70
80
Depth (m)
0
200
400
600
800
68
70
73
77
91
97
105
140
143
145
G
J

Figure 6(b)

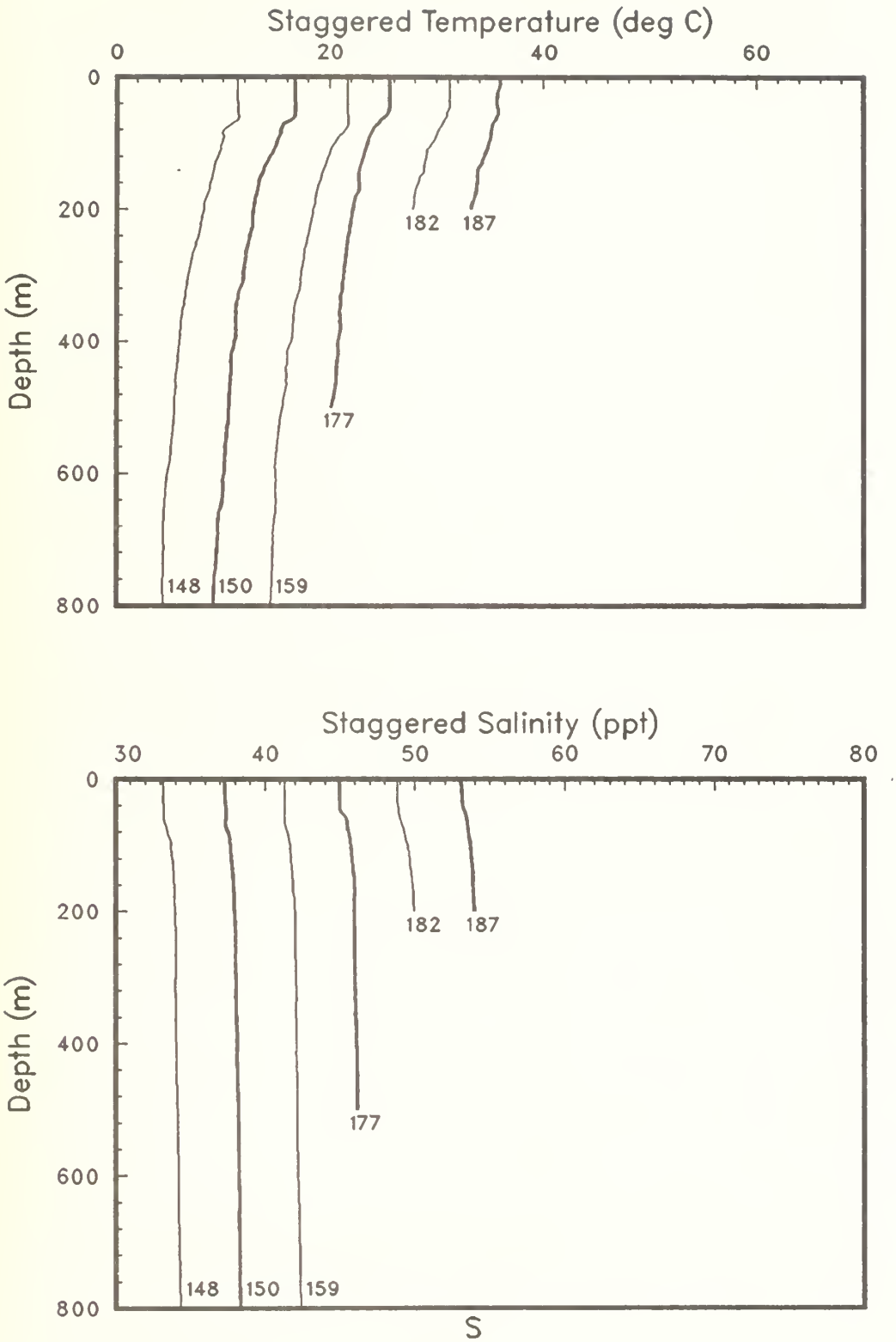
Staggered Temperature (deg C)
0
20
40
60
0
200
400
600
800
Depth (m)
148
150
159
177
182
187
Staggered Salinity (ppt)
30
40
50
60
70
80
0
200
400
600
800
Depth (m)
148
150
159
177
182
187
S

Figure 6(c)

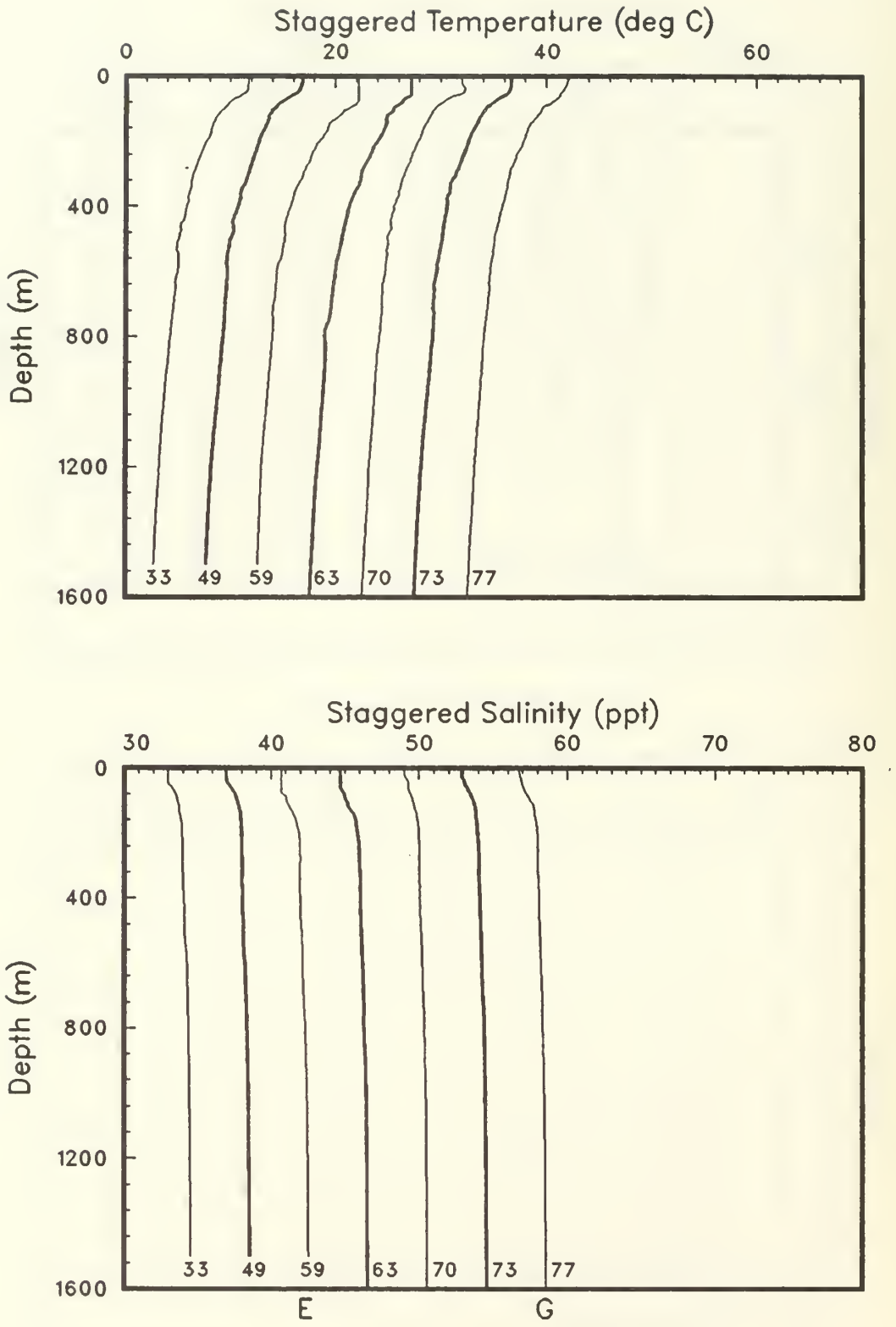

Figure 7(a): Casts deeper than 800m (OPTOMA15, Leg DI).

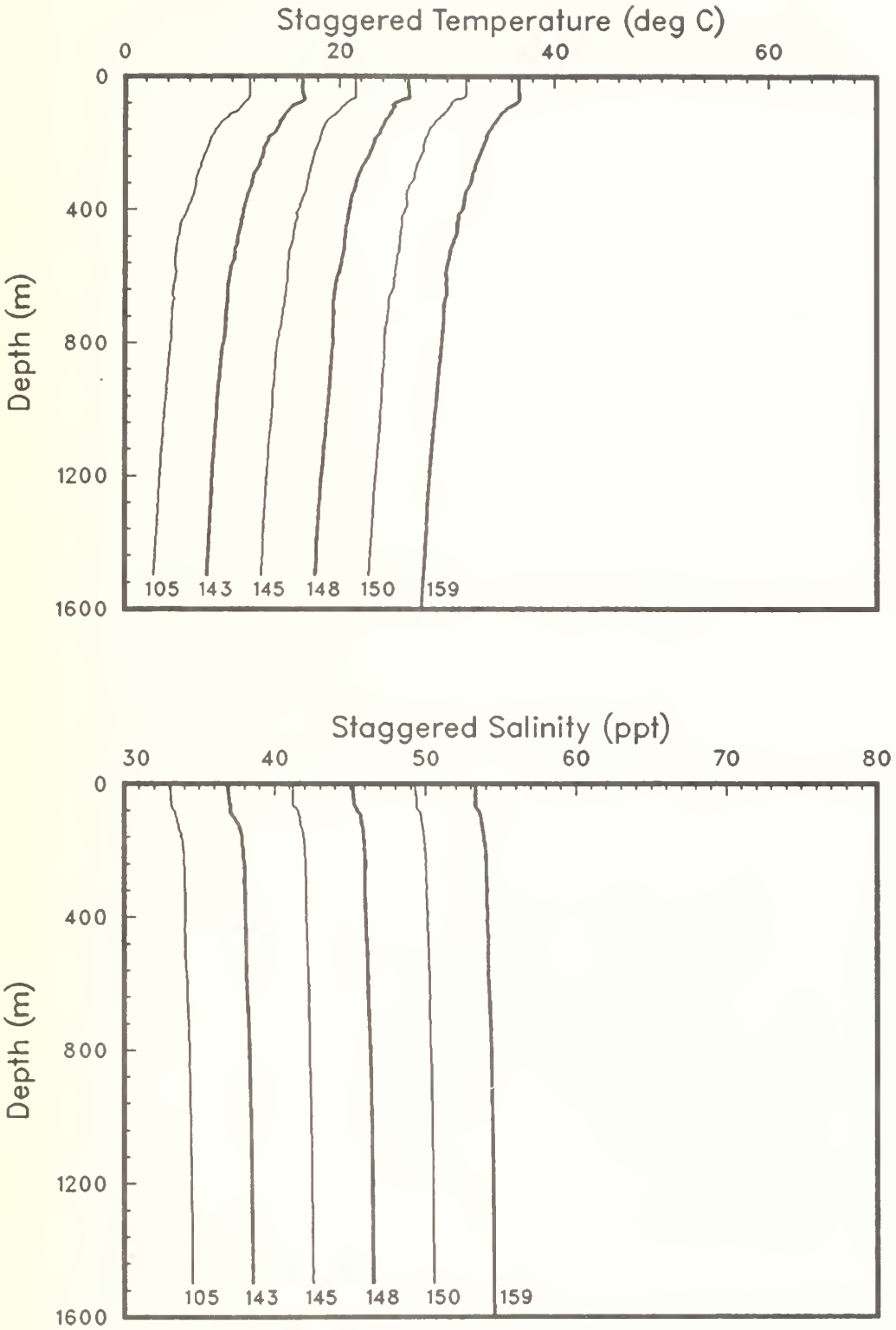
Staggered Temperature (deg C)
0
20
40
60
0
400
800
1200
1600
Depth (m)
105
143
145
148
150
159
Staggered Salinity (ppt)
30
40
50
60
70
80
0
400
800
1200
1600
Depth (m)
105
143
145
148
150
159

Figure 7(b)

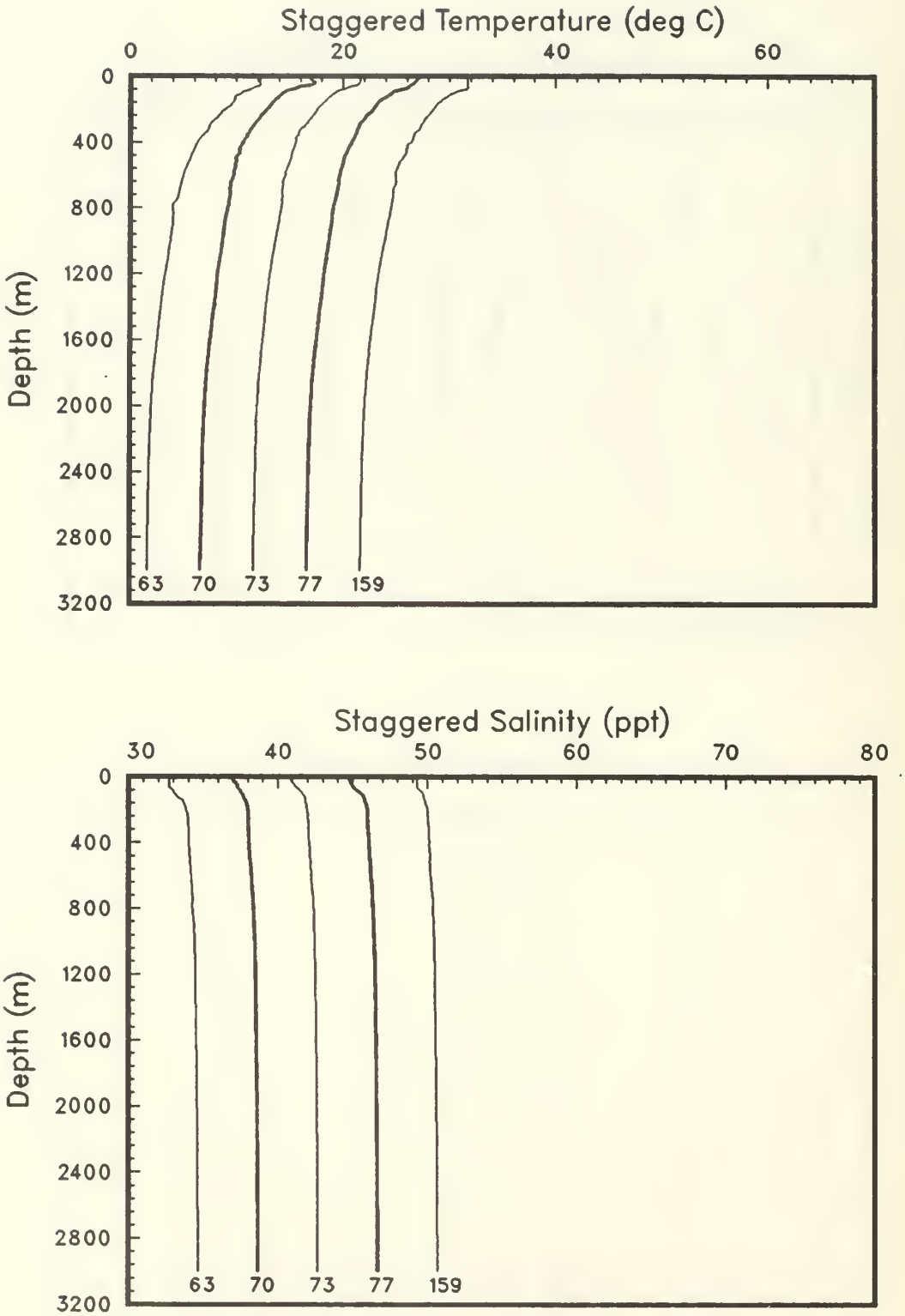

Figure 8: Casts deeper than 1600m (OPTOMA15, Leg DI).

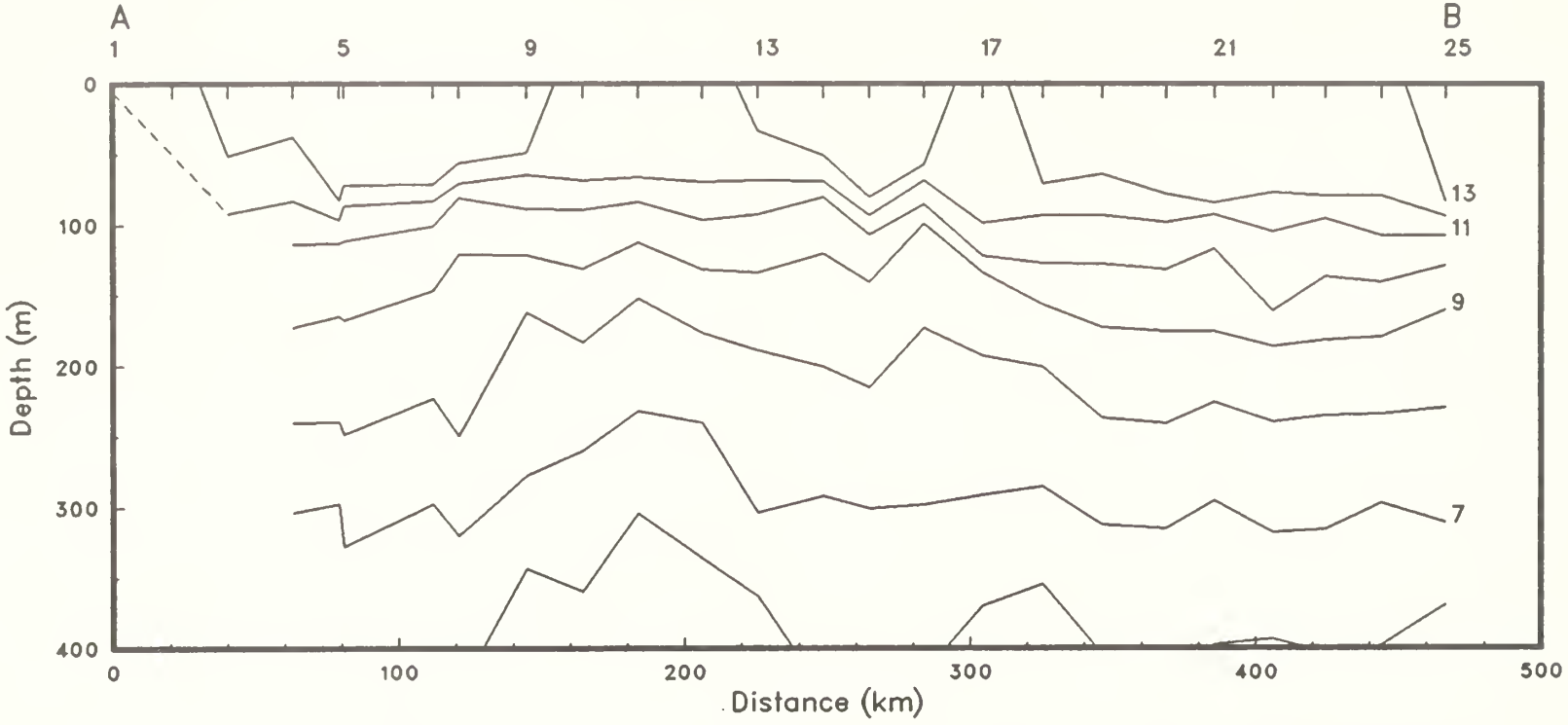

Figure 9(a): Along-track isotherms. Tick marks along the upper horizontal axis show station positions. Some station numbers are given. Dashed lines are used if the cast was too shallow (OPTOMA15, Leg DI).

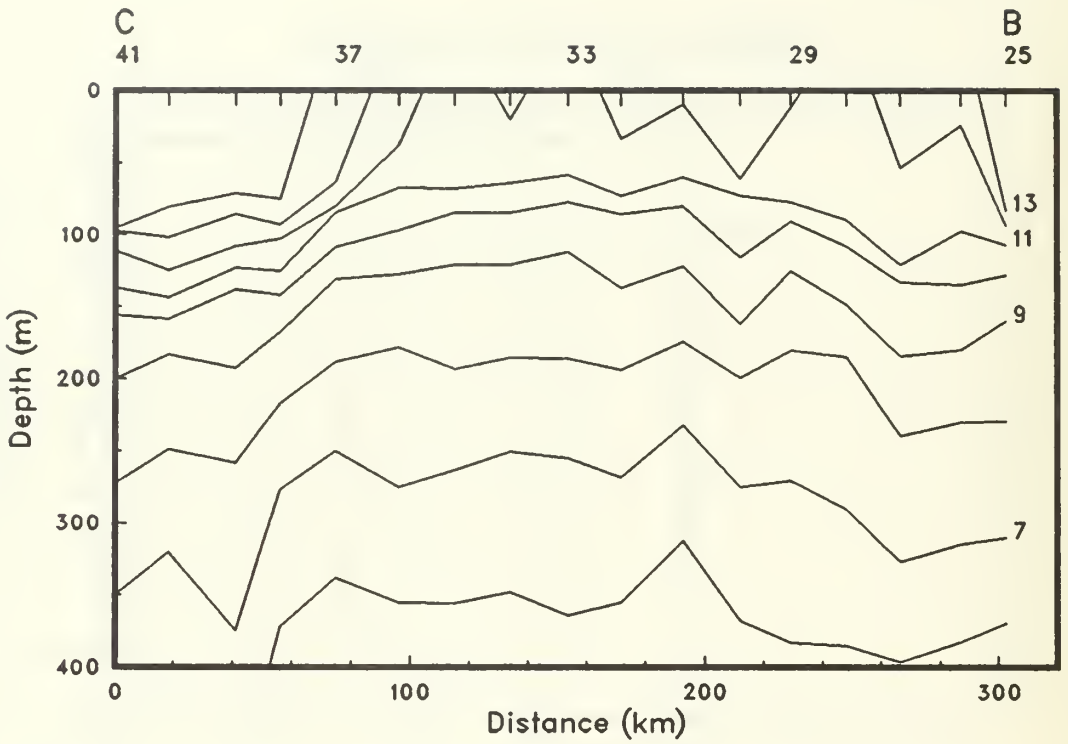

Figure 9(b)

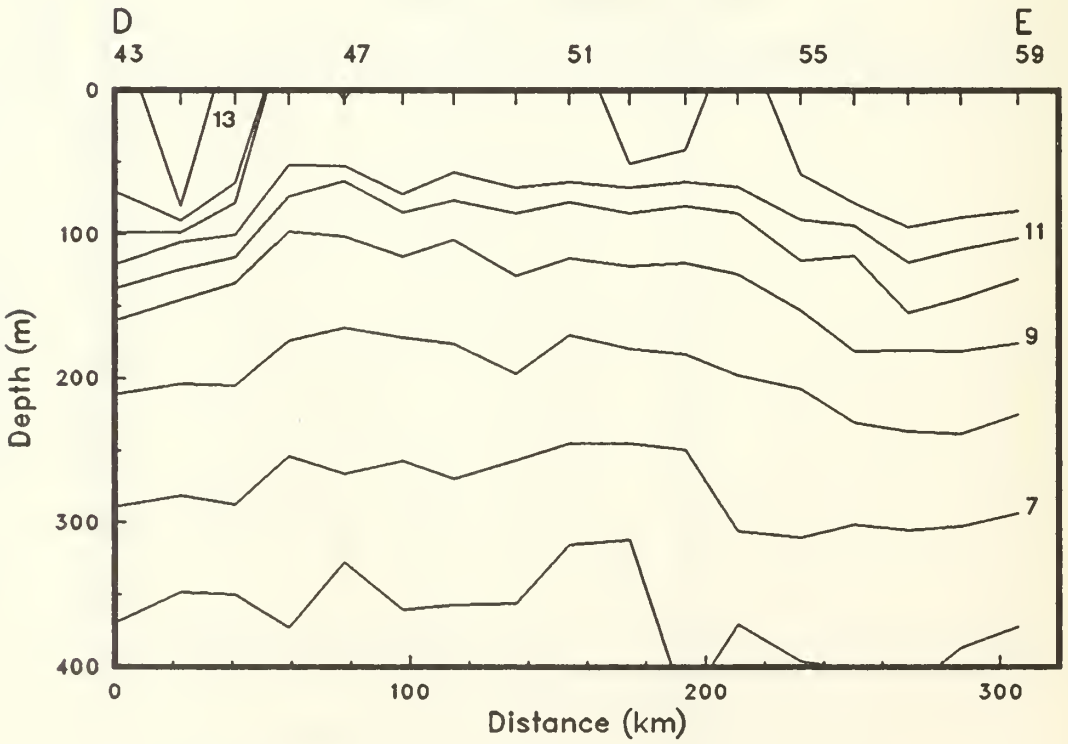

Figure 9(c)

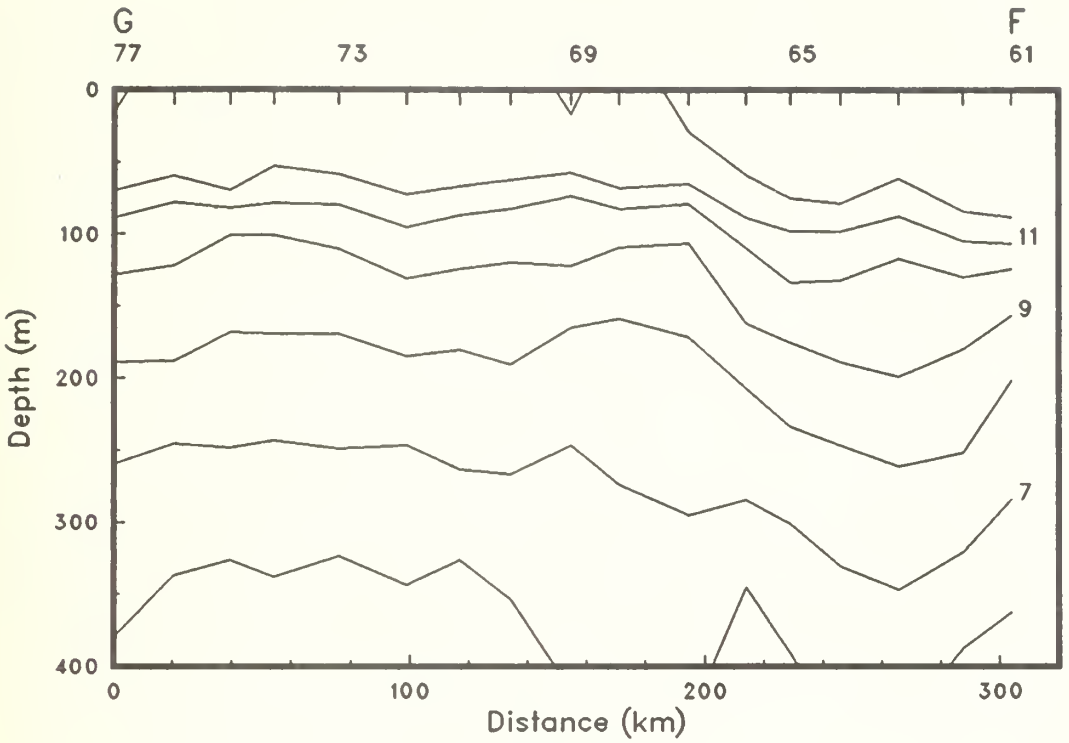

Figure 9(d)

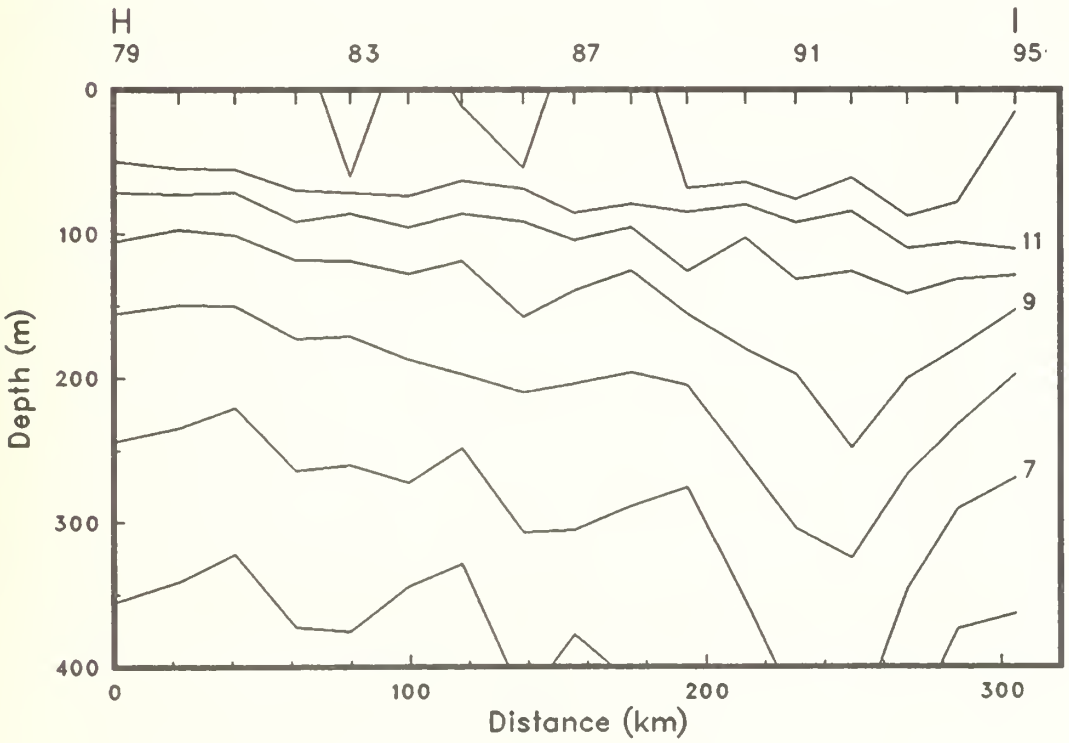

Figure 9(e)

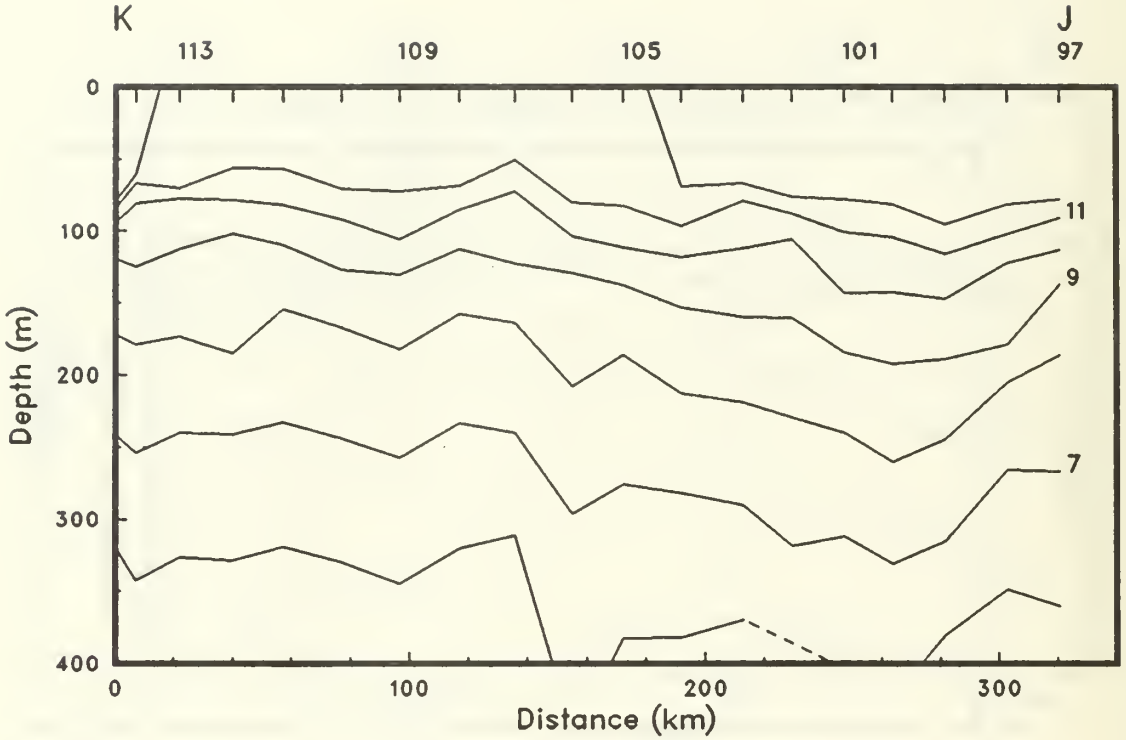

Figure 9(f)

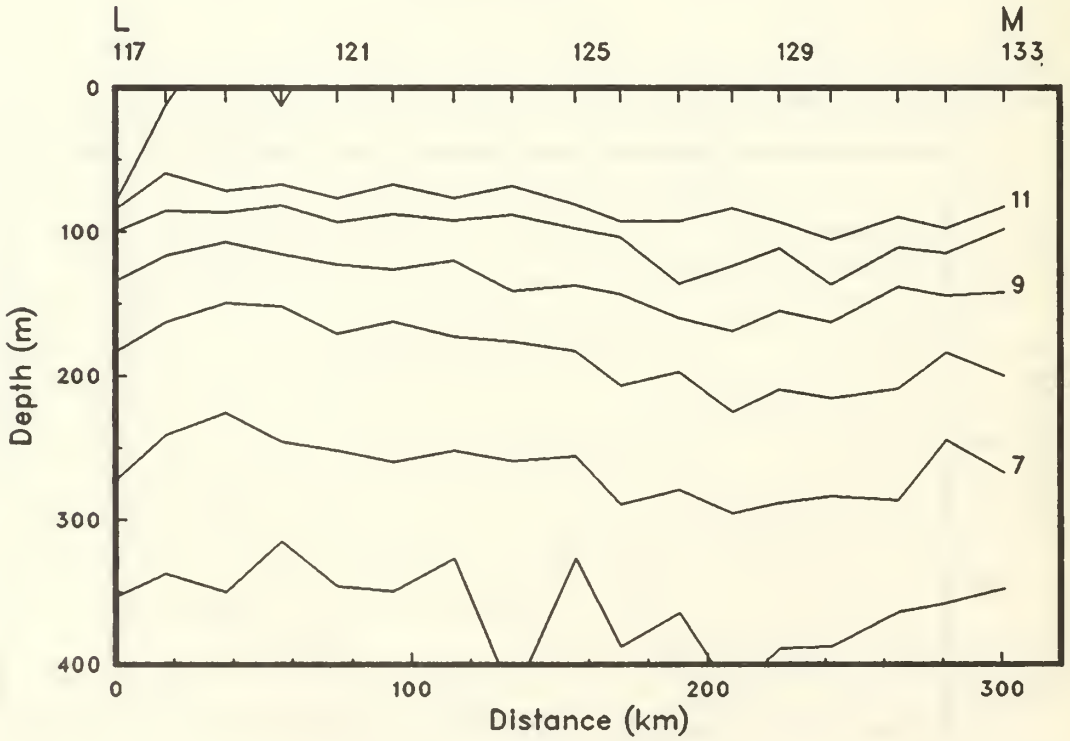

Figure 9(g)

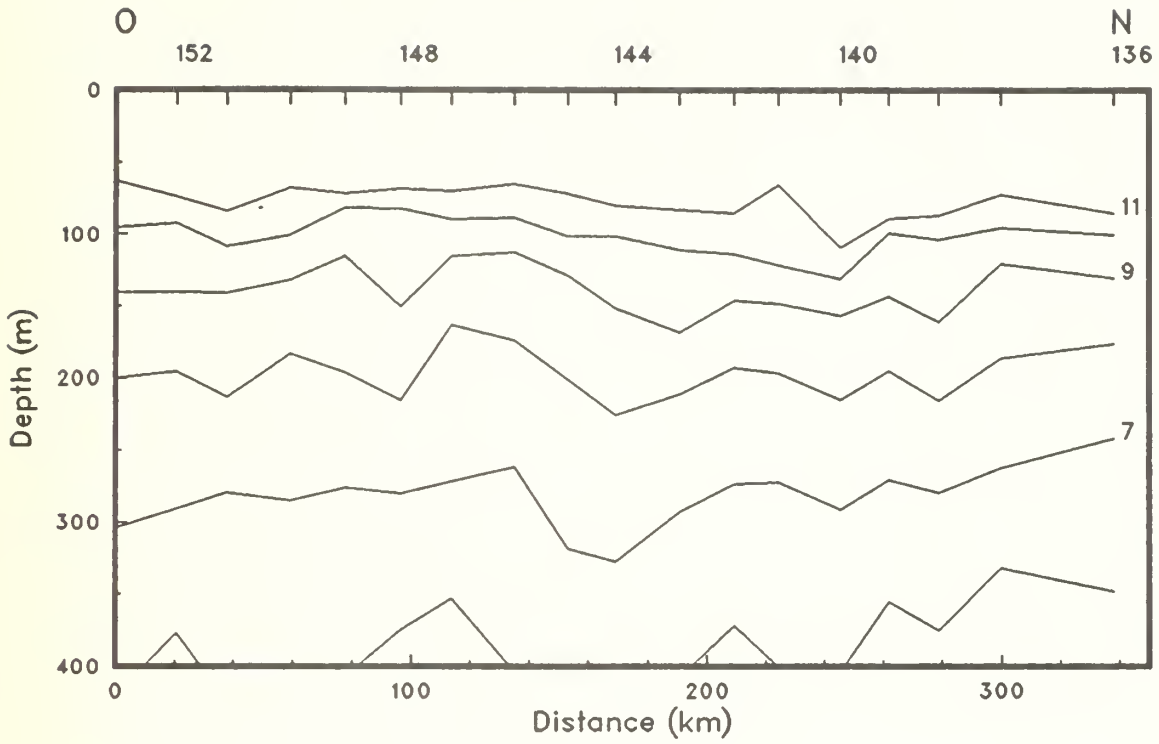

Figure 9(h)

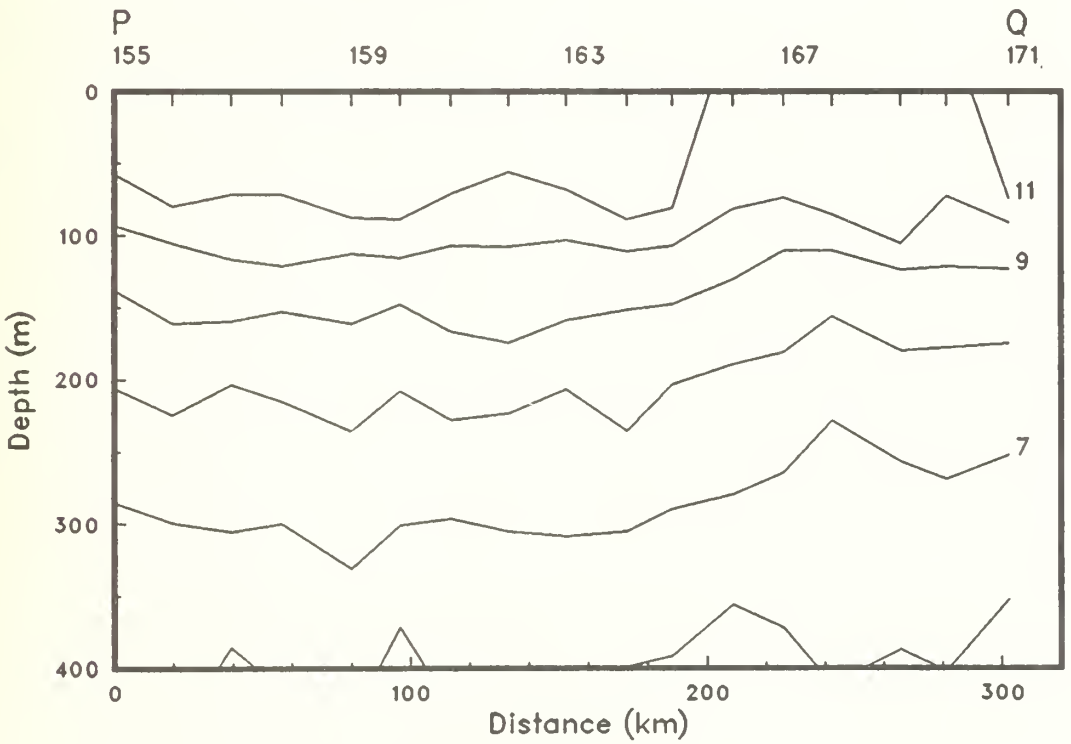

Figure 9(i)

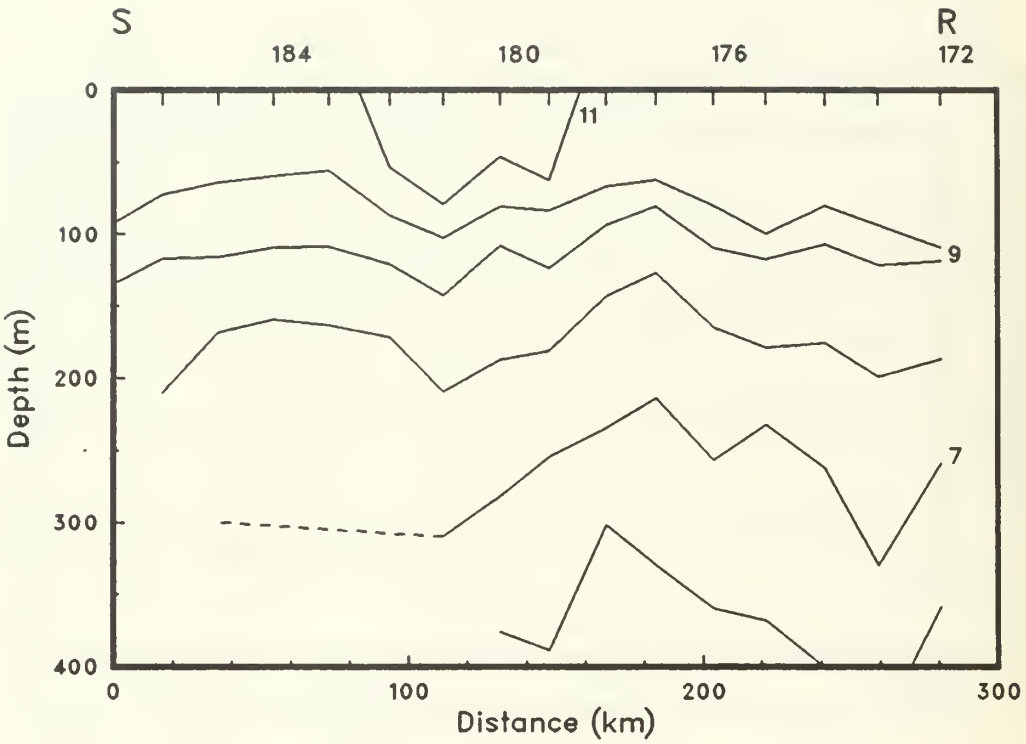

Figure 9(j)

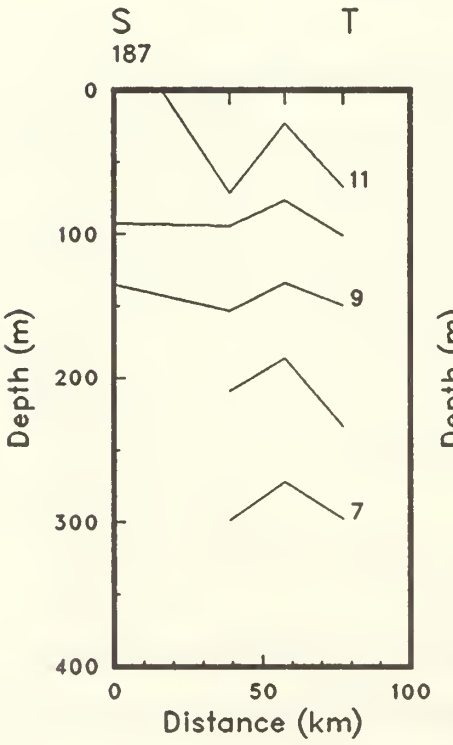

Figure 9(k)

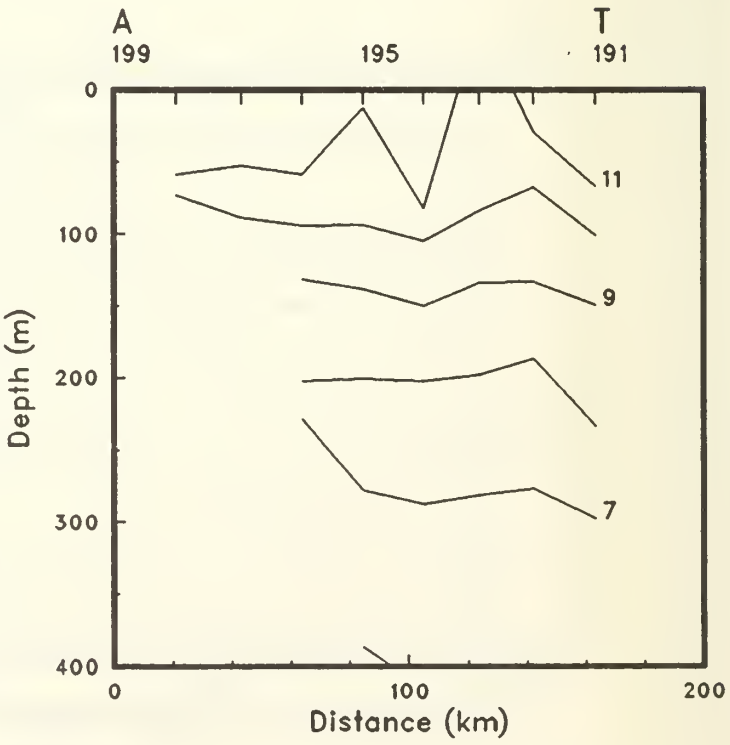

Figure 9(l)

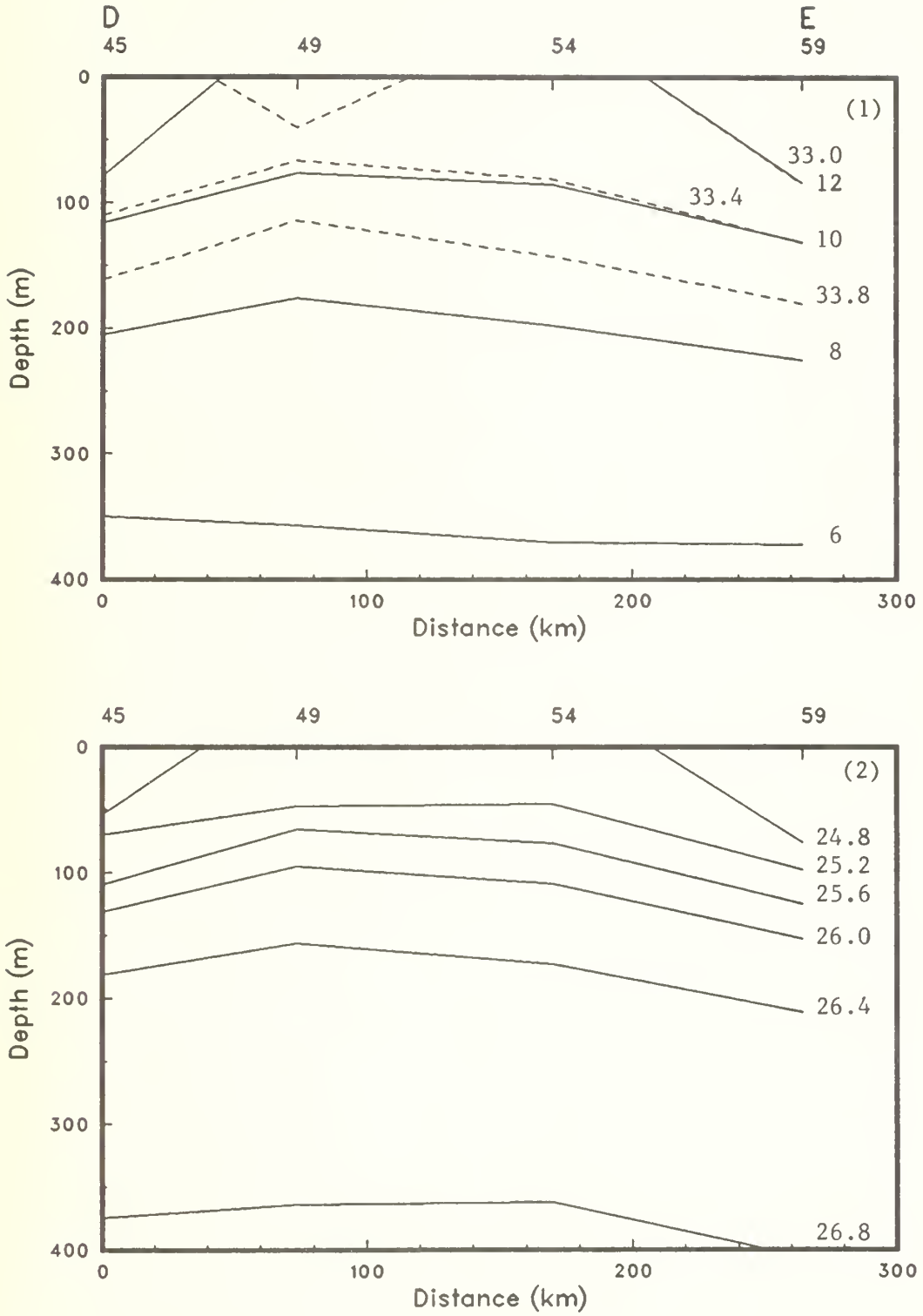

Figure 10(a): Isopleths of (1) temperature and salinity and (2) sigma-t from the CTD's (OPTOMA15, Leg DI).

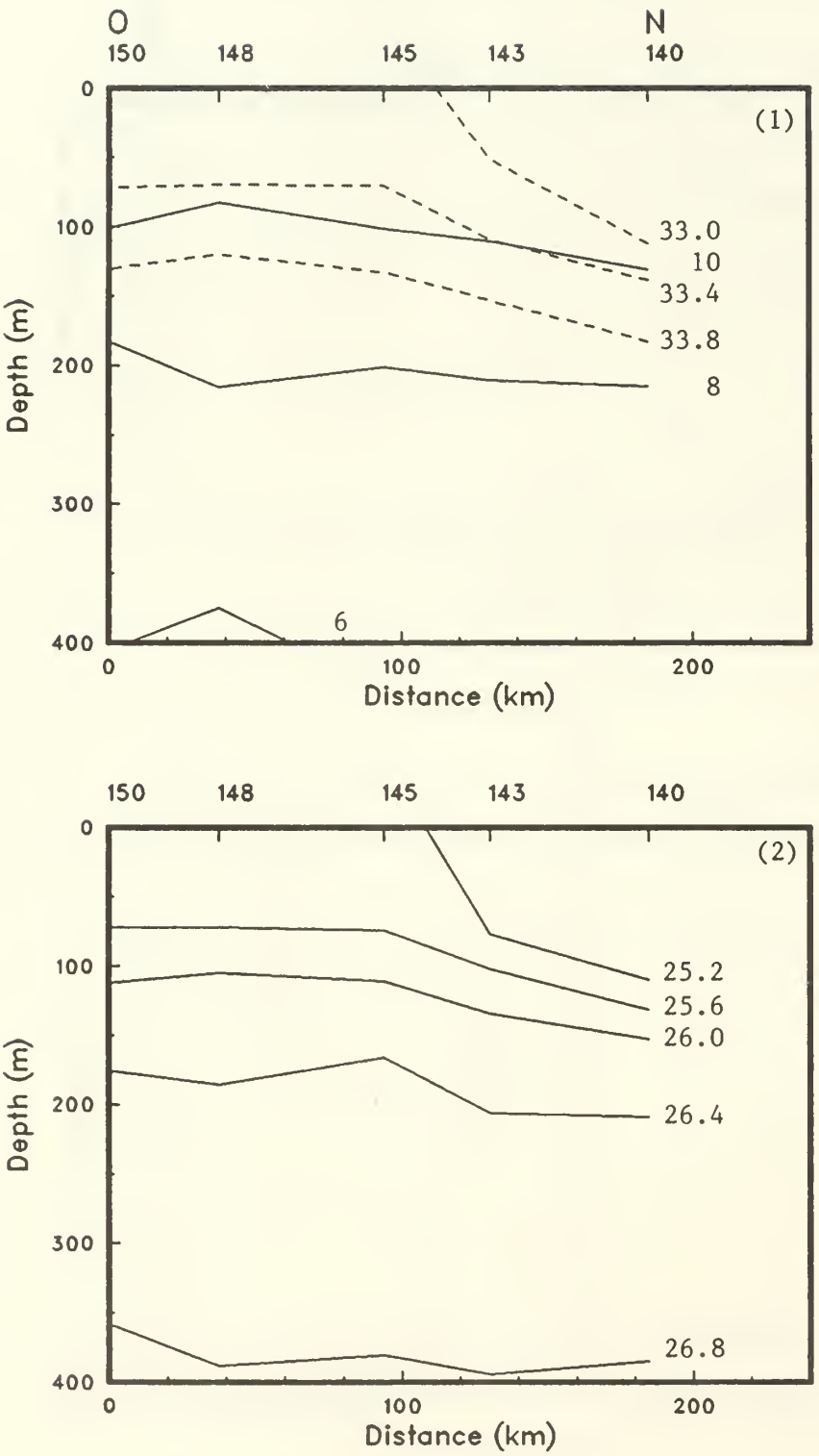
O
N
150
148
145
143
140
(1)
33.0
10
33.4
33.8
8
6
Depth (m)
Distance (km)
(2)
25.2
25.6
26.0
26.4
26.8

Figure 10(b)

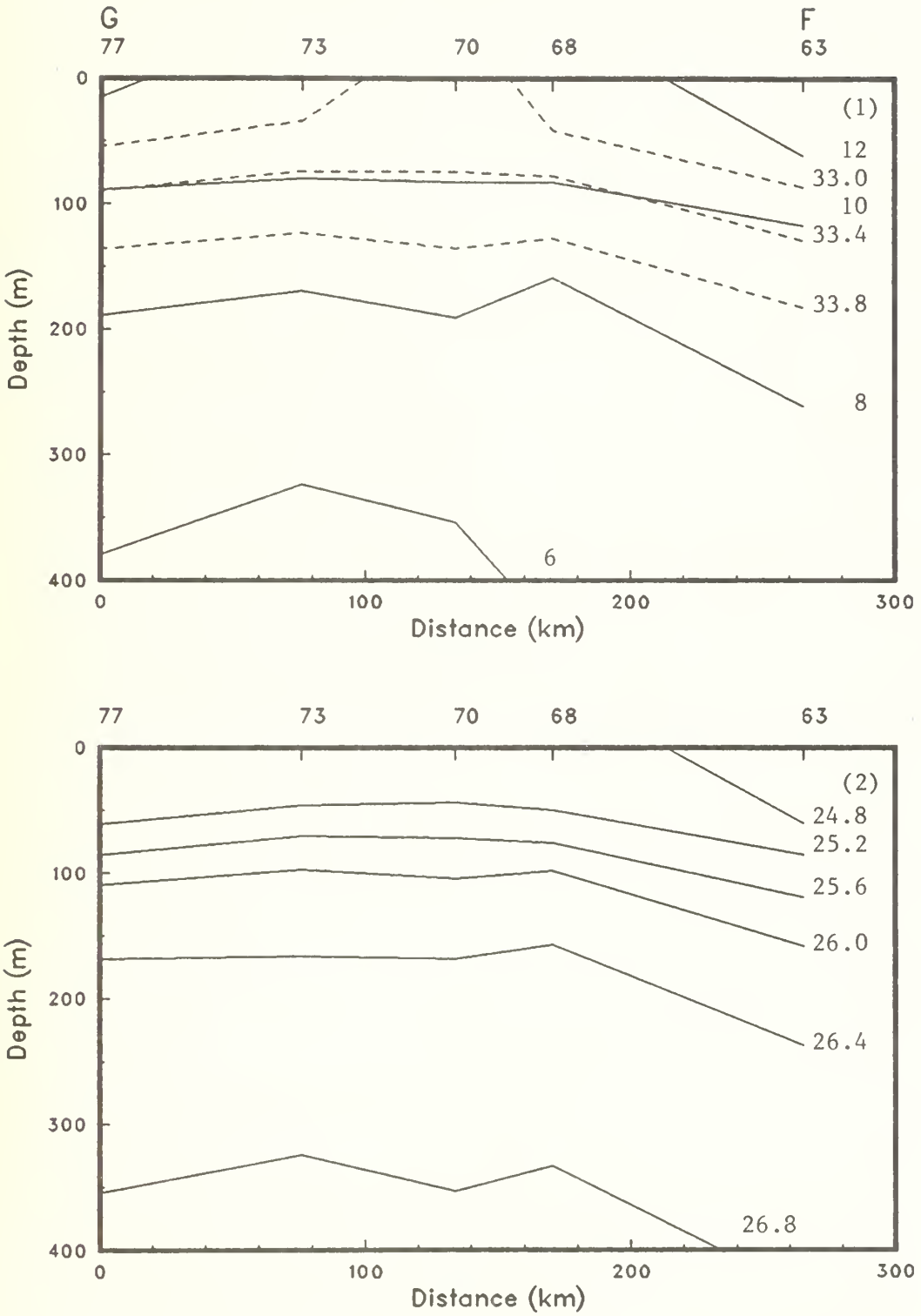
G
F
77
73
70
68
63
(1)
12
33.0
10
33.4
33.8
8
6
Depth (m)
Distance (km)
(2)
24.8
25.2
25.6
26.0
26.4
26.8

Figure 10(c)

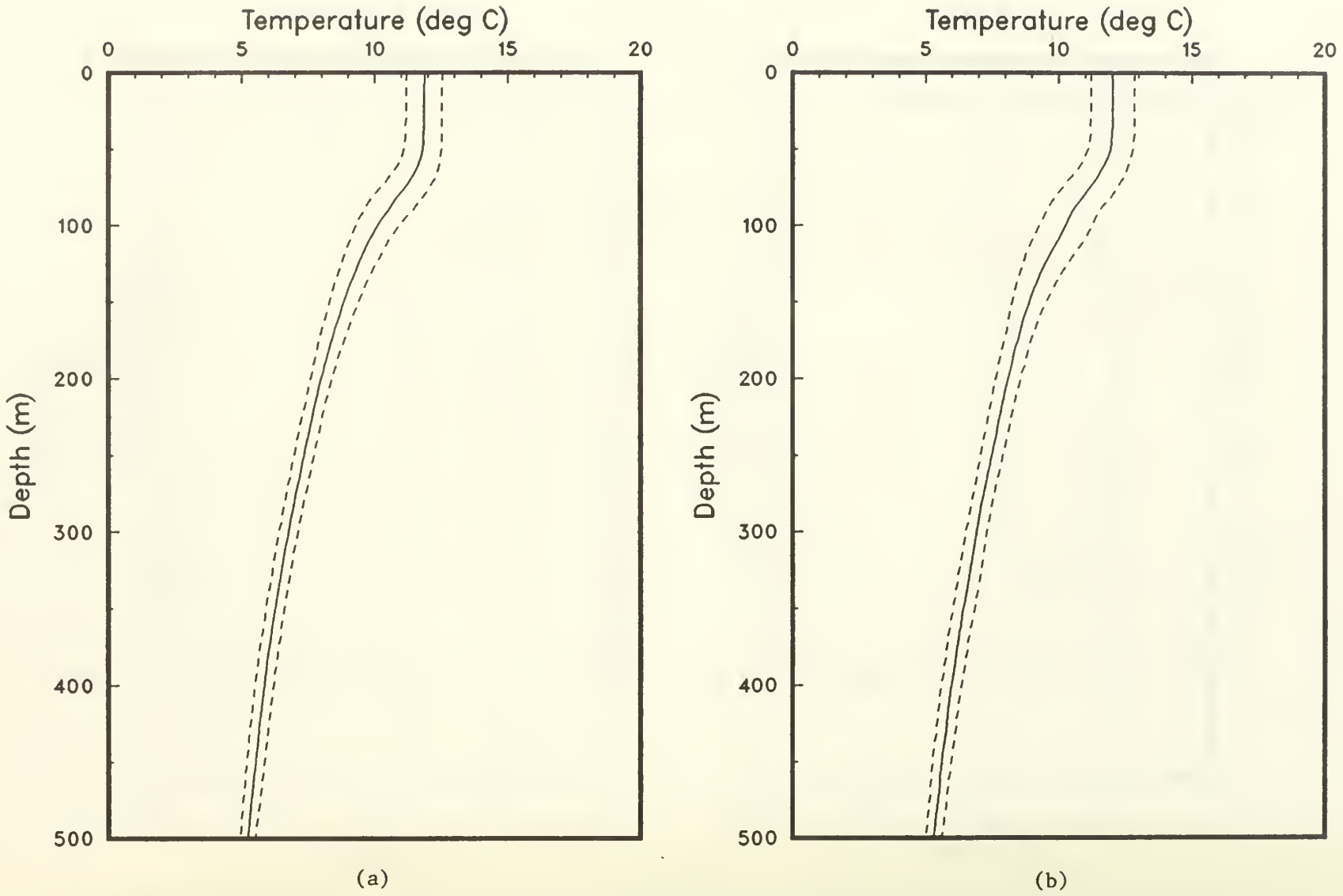

Figure 11: Mean temperature profiles from (a) XBT's and (b) CTD's, with + and - the standard deviation (OPTOMA15, Leg DI).

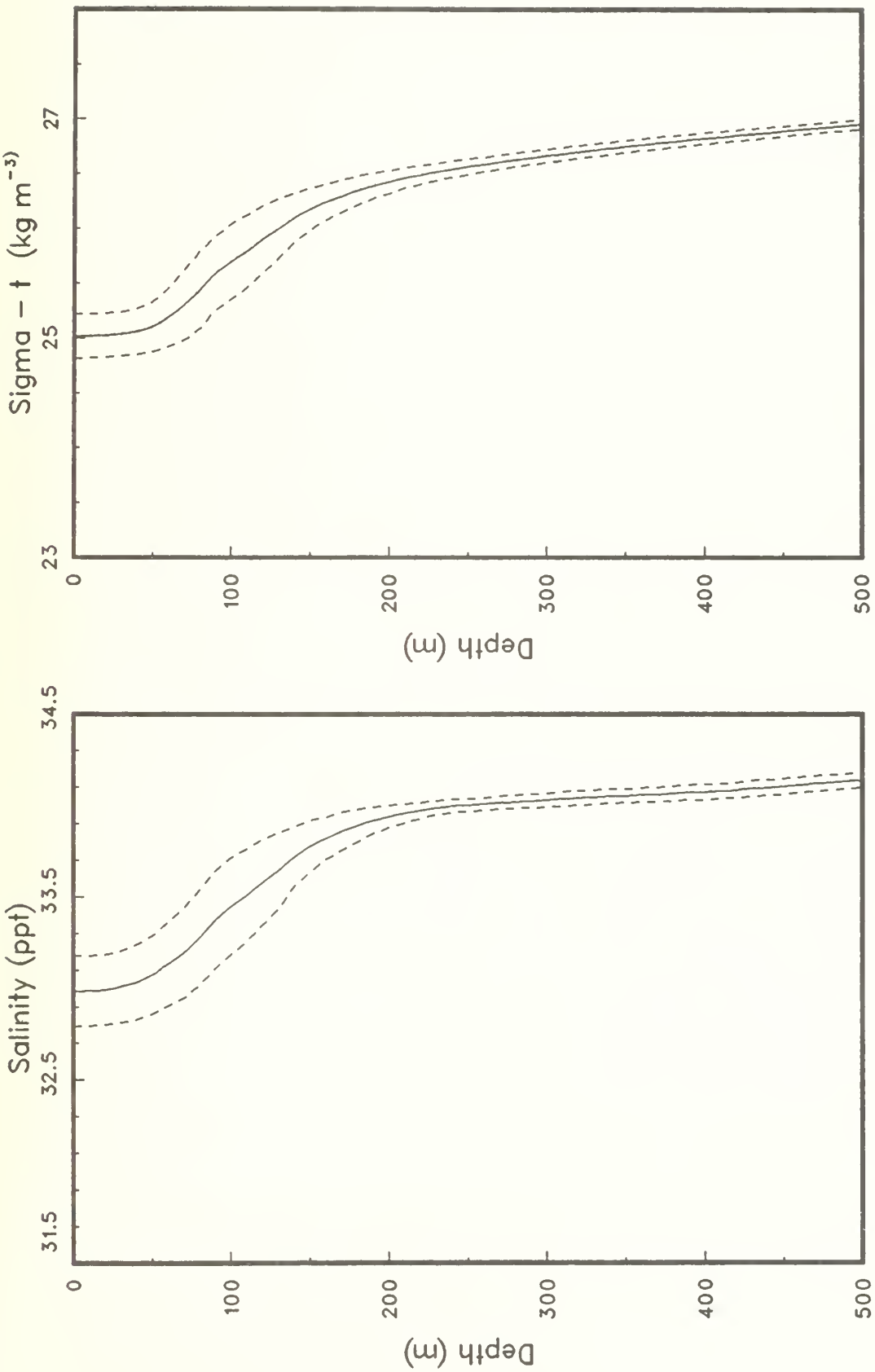

Figure 12: Mean profiles of (a) salinity and (b) sigma-t, with + and - the standard deviations, from the CTD's (OPTOMA15, Leg DI).

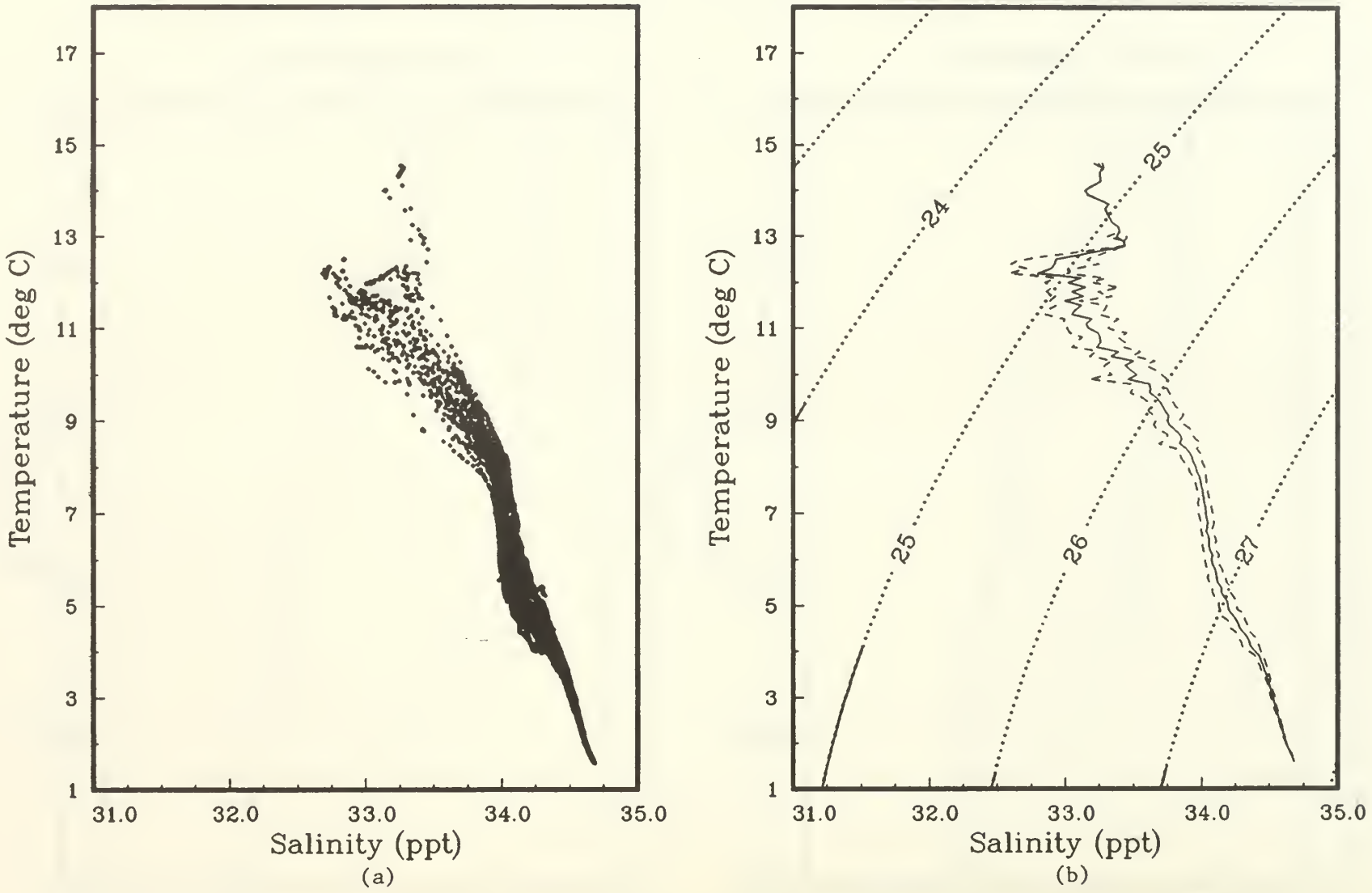

Figure 13: (a) T-S pairs and (b) mean T-S relation, with + and - the standard deviation, from the CTD's. Selected sigma-t contours are also shown (OPTOMA15, Leg DI).

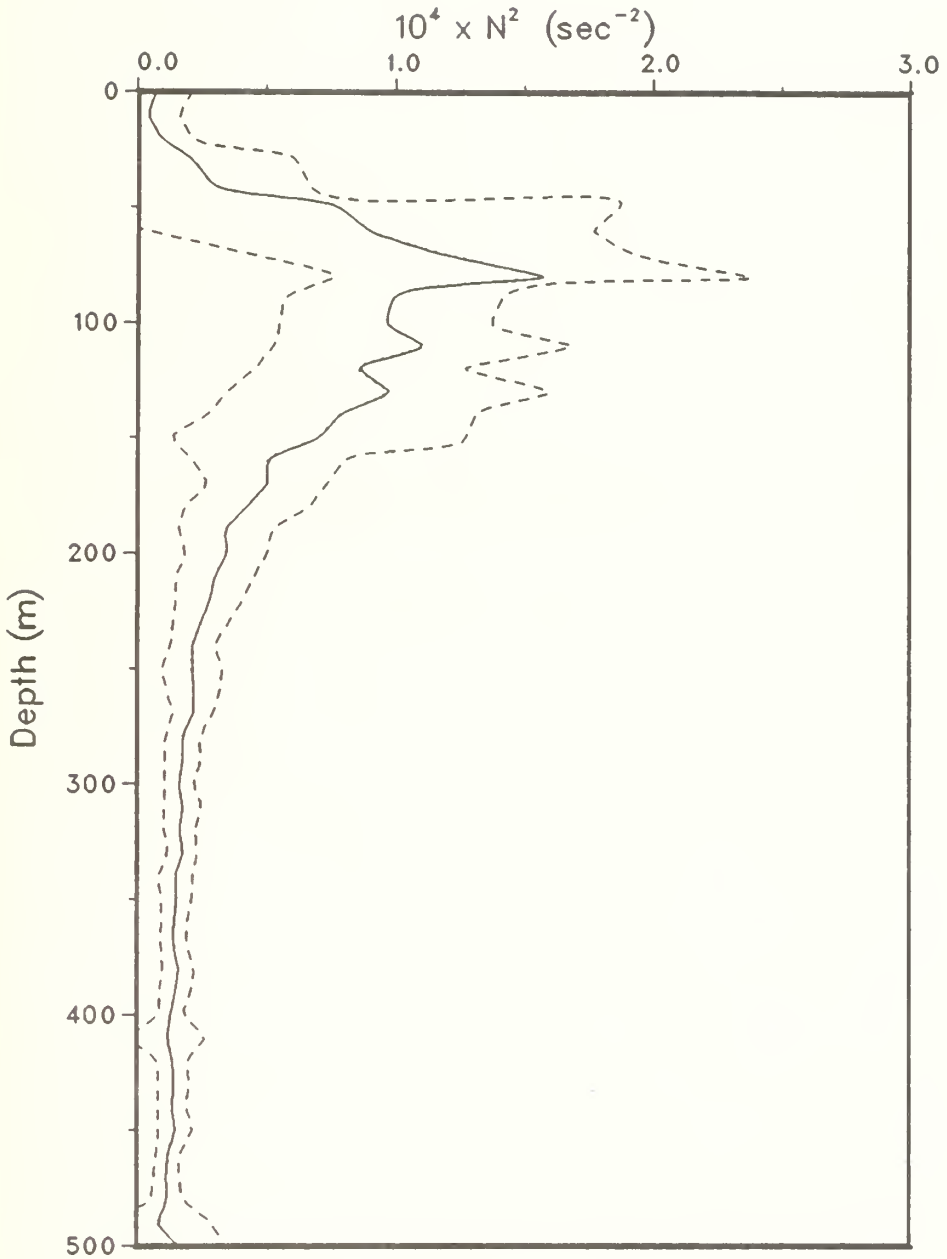

Figure 14: Mean N^2 profile(——), with + and - the standard deviation (----). The N^2 profile from $\overline{T(z)}$ and $\overline{S(z)}$ is also shown (....) (OPTOMA15, Leg DI).

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Section 2

OPTOMA15 Leg P

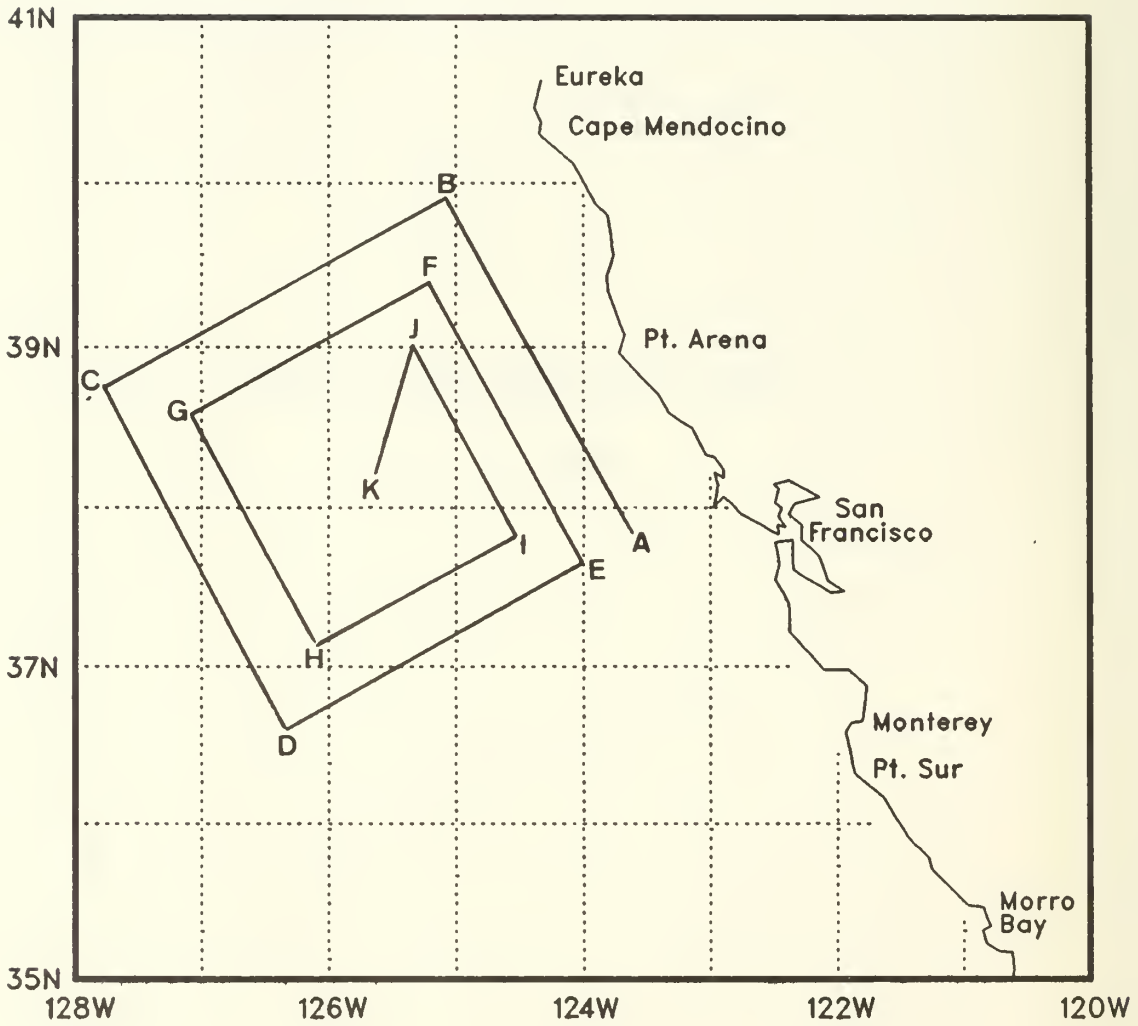


Figure 15: The flight track for OPTOMA15, Leg P.

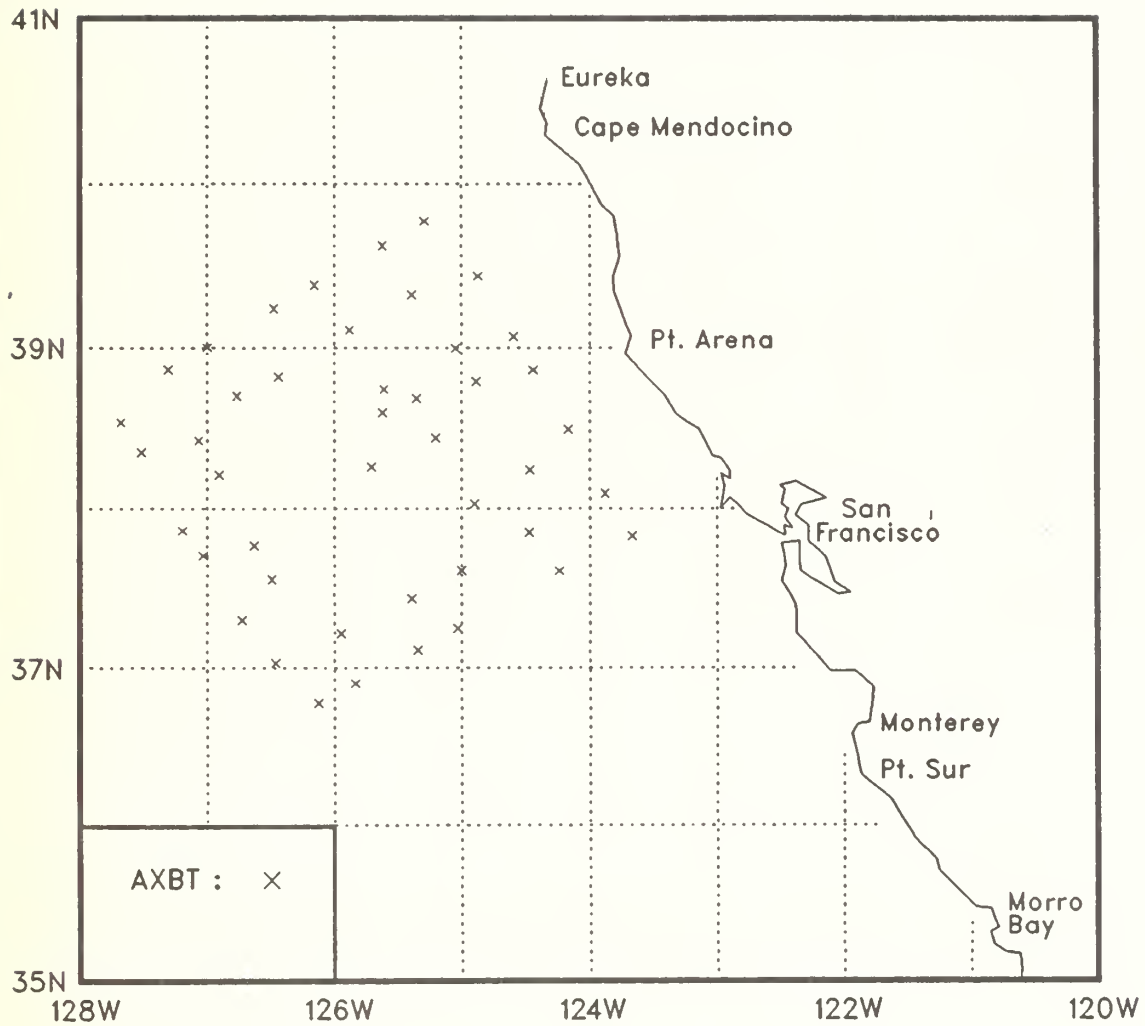


Figure 16: AXBT locations for OPTOMA15, Leg P.

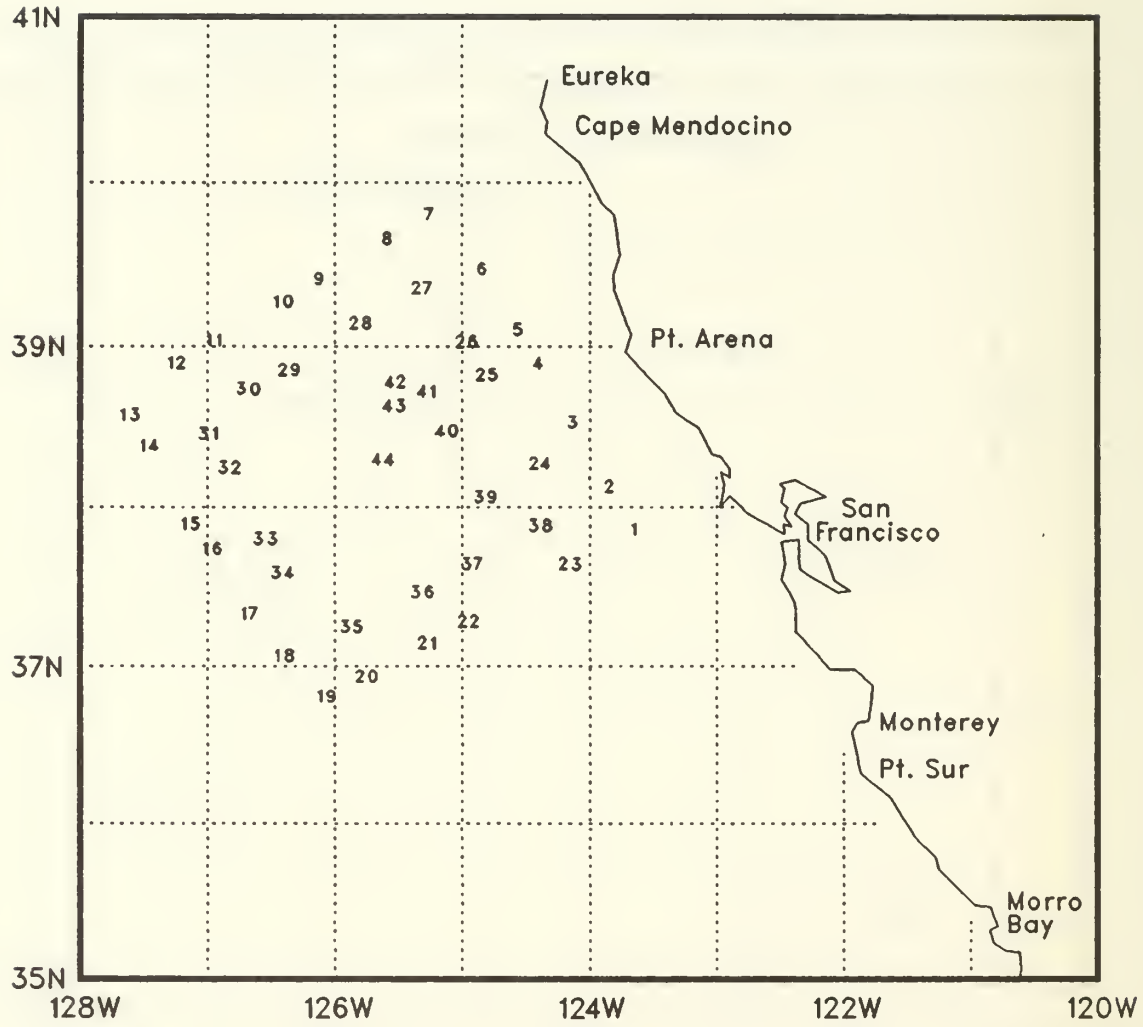


Figure 17: Station numbers for OPTOMA15, Leg P.

Table 3 : Leg P Station Listing

STN	TYPE	YR/DAY	GMT	LAT (NORTH) (DD.MM)	LONG (WEST) (DDD.MM)	SURFACE TEMP (DEG C)
1	AXBT	85027	1651	37.50	123.40	12.4
2	AXBT	85027	1701	38.06	123.53	12.0
3	AXBT	85027	1712	38.30	124.10	12.2
4	AXBT	85027	1722	38.52	124.26	12.6
5	AXBT	85027	1728	39.04	124.36	12.0
6	AXBT	85027	1738	39.26	124.52	12.3
7	AXBT	85027	1751	39.46	125.18	11.6
8	AXBT	85027	1757	39.38	125.37	11.8
9	AXBT	85027	1807	39.23	126.09	12.3
10	AXBT	85027	1813	39.15	126.29	12.2
11	AXBT	85027	1824	39.00	127.00	12.5
12	AXBT	85027	1830	38.52	127.18	12.1
13	AXBT	85027	1840	38.32	127.41	12.1
14	AXBT	85027	1846	38.21	127.31	11.9
15	AXBT	85027	1856	37.52	127.12	11.9
16	AXBT	85027	1902	37.43	127.02	11.8
17	AXBT	85027	1912	37.18	126.44	13.7
18	AXBT	85027	1918	37.02	126.28	14.5
19	AXBT	85027	1929	36.47	126.08	14.6
20	AXBT	85027	1937	36.54	125.50	14.3
21	AXBT	85027	1947	37.07	125.21	11.8
22	AXBT	85027	1953	37.15	125.02	11.7
23	AXBT	85027	2009	37.37	124.14	12.5
24	AXBT	85027	2031	38.15	124.28	12.4
25	AXBT	85027	2040	38.48	124.53	12.0
26	AXBT	85027	2050	39.00	125.03	12.2
27	AXBT	85027	2102	39.20	125.24	12.0
28	AXBT	85027	2111	39.07	125.53	12.1
29	AXBT	85027	2121	38.49	126.27	12.5
30	AXBT	85027	2127	38.42	126.46	12.1
31	AXBT	85027	2137	38.26	127.04	12.1
32	AXBT	85027	2142	38.13	126.54	11.9
33	AXBT	85027	2152	37.46	126.38	12.2
34	AXBT	85027	2159	37.34	126.30	11.7
35	AXBT	85027	2213	37.13	125.57	11.7
36	AXBT	85027	2225	37.26	125.24	11.9
37	AXBT	85027	2232	37.37	125.00	12.0
38	AXBT	85027	2242	37.51	124.28	12.6
39	AXBT	85027	2300	38.02	124.54	12.0
40	AXBT	85027	2309	38.27	125.12	12.2
41	AXBT	85027	2315	38.41	125.21	11.8
42	AXBT	85027	2327	38.45	125.37	11.9
43	AXBT	85027	2330	38.36	125.37	11.9
44	AXBT	85027	2336	38.16	125.43	12.4

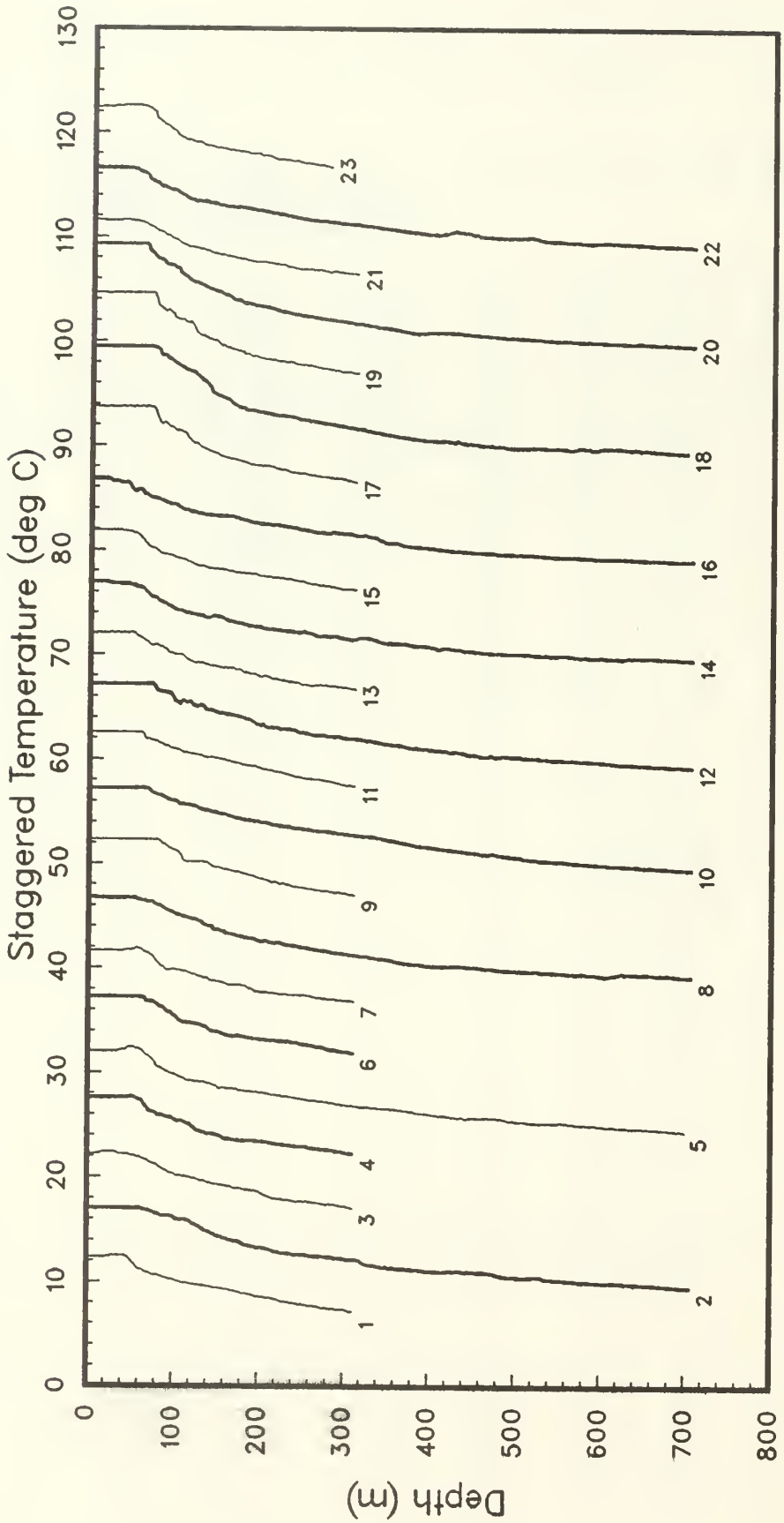
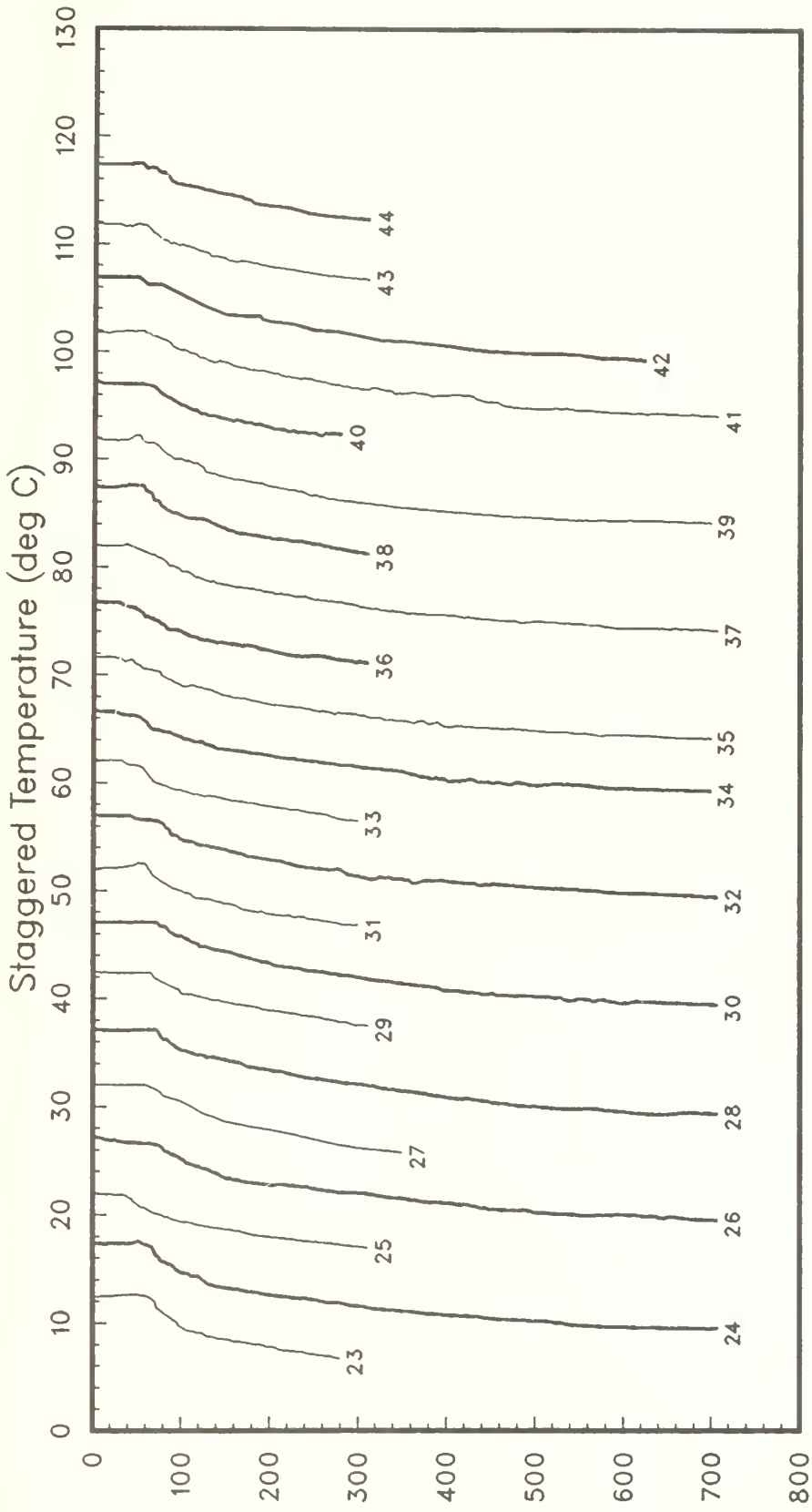


Figure 18(a): AXBT temperature profiles, staggered by multiples of 5C (OPTOMA15, Leg P).


Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
Depth (m)
0
100
200
300
400
500
600
700
800
23
24
25
26
27
28
29
30
31
32
33
34
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36
37
38
39
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42
43
44
E
F
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H
I
J
K

Figure 18(b)

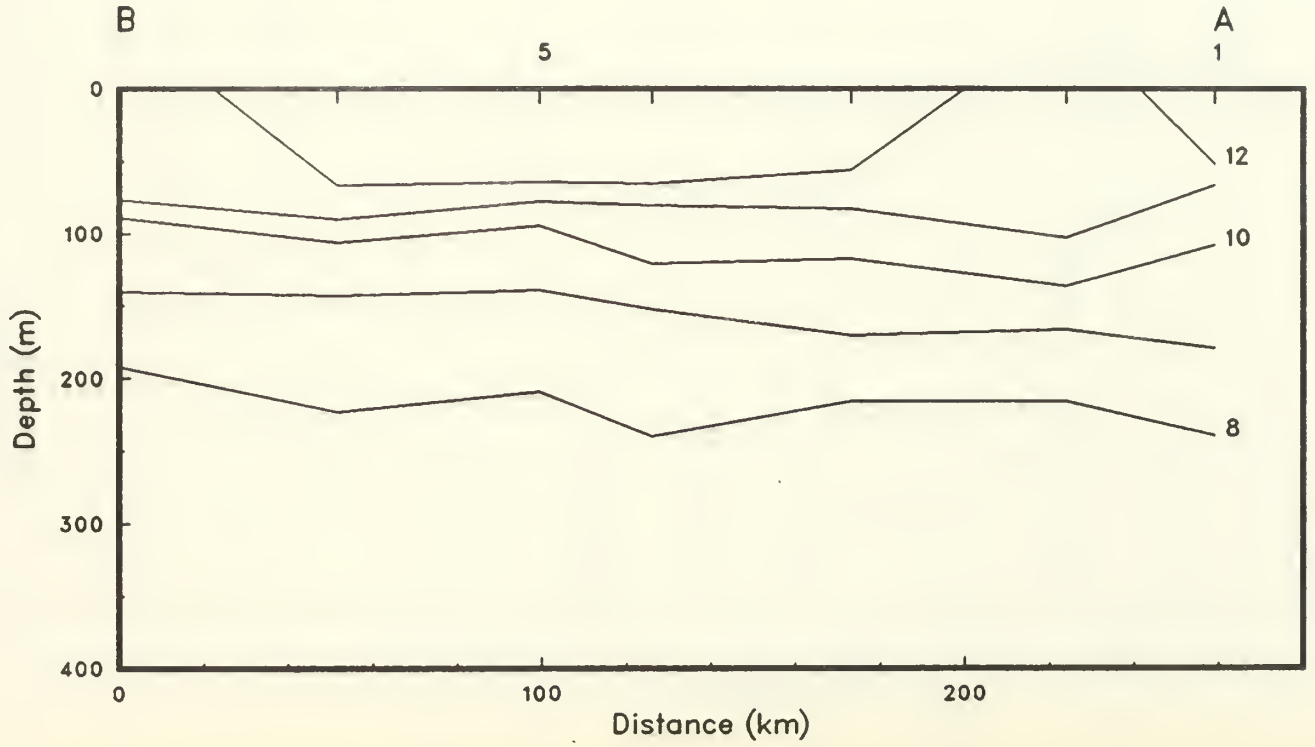

Figure 19(a): Along-track isotherms. Tick marks along the upper horizontal axis show station positions. Some station numbers are given. Dashed lines are used if the cast was too shallow (OPTOMA15, Leg P).

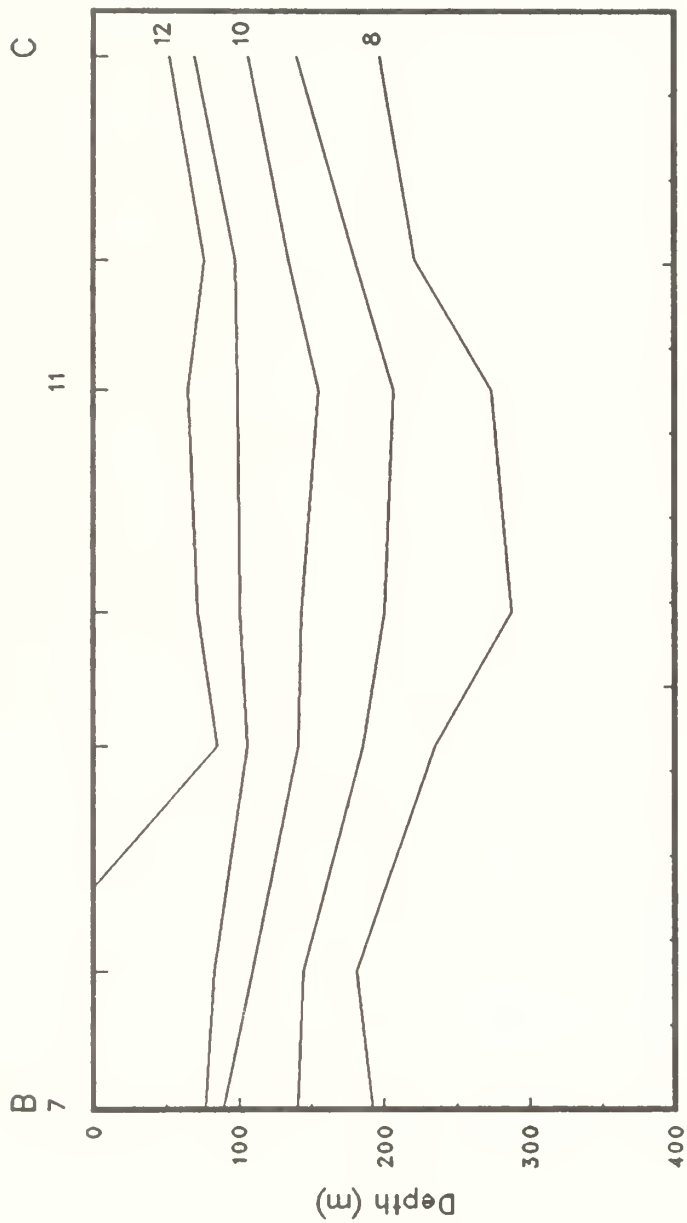

Figure 19(b)

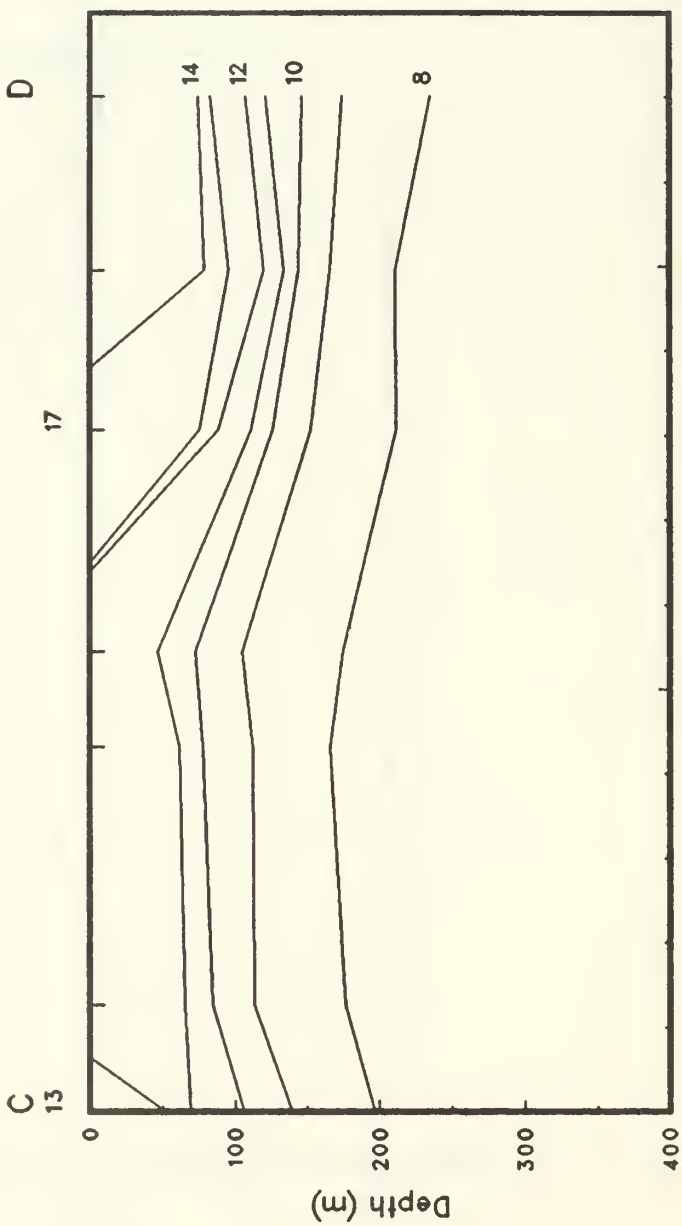

Figure 19(c)

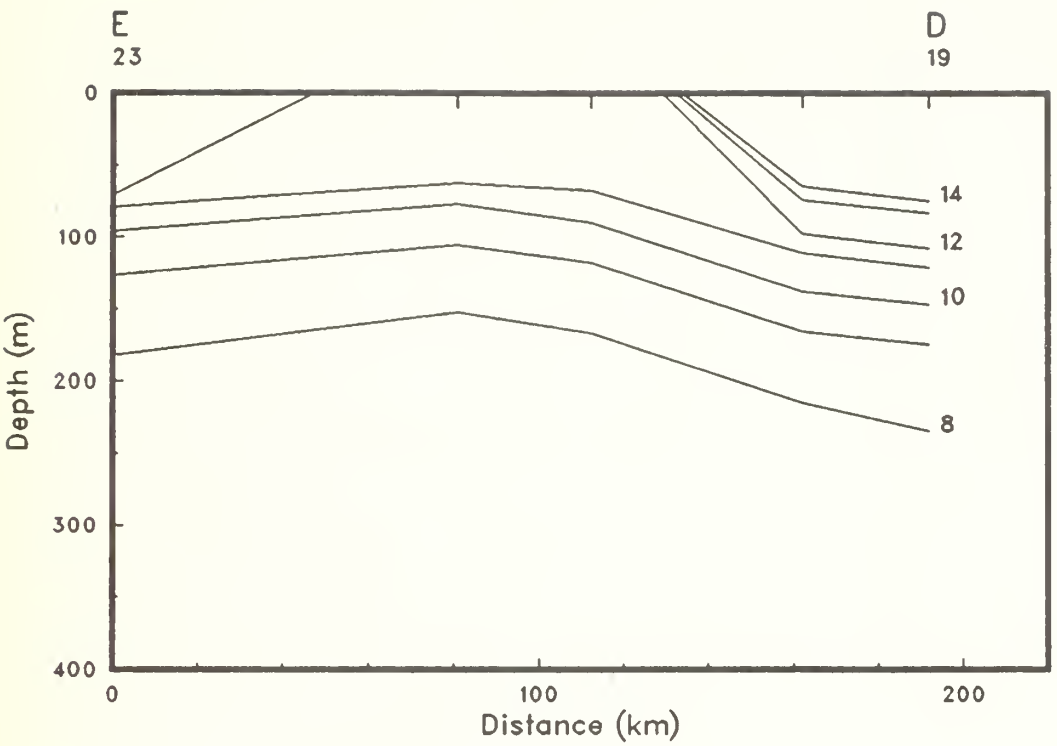

Figure 19(d)

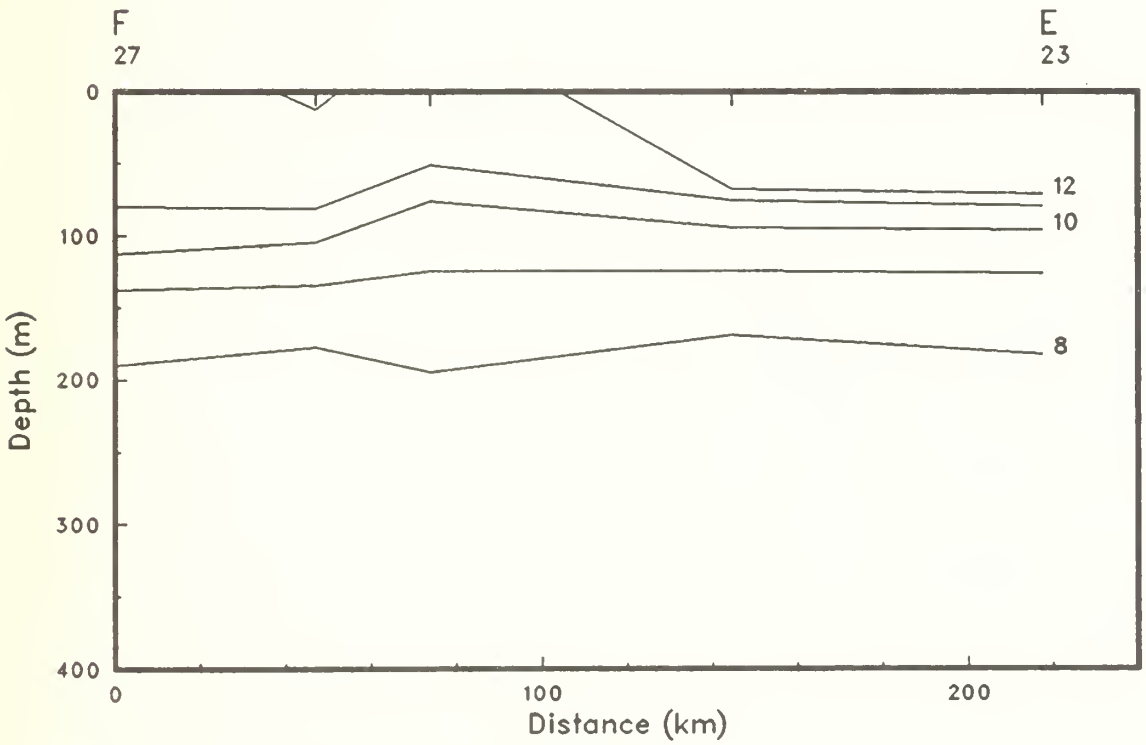

Figure 19(e)

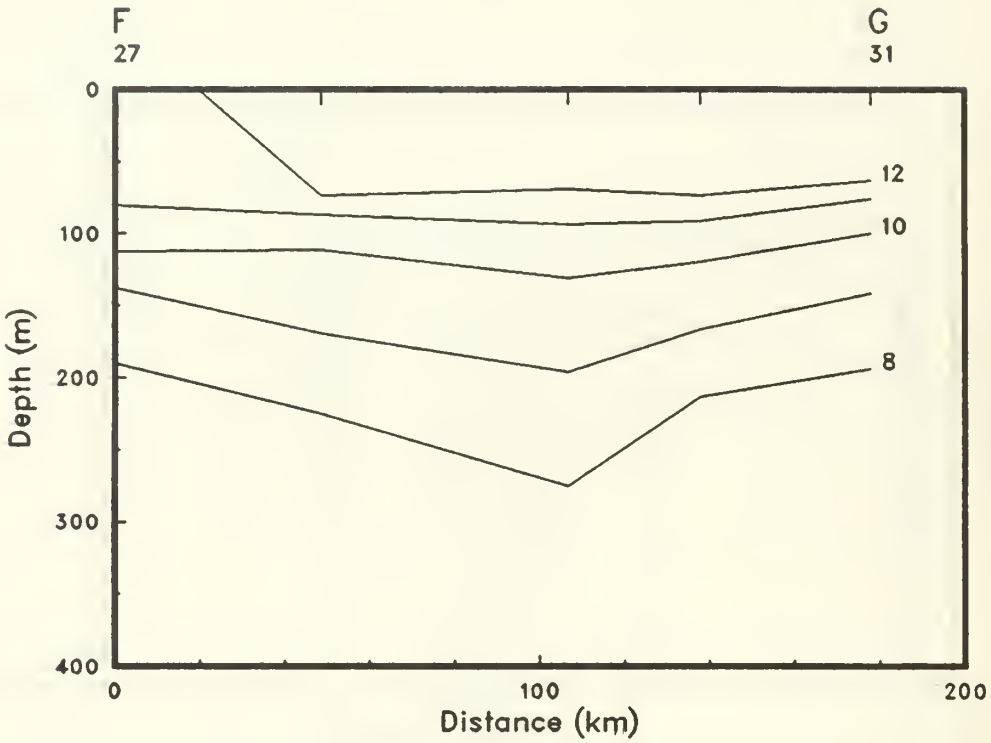

Figure 19(f)

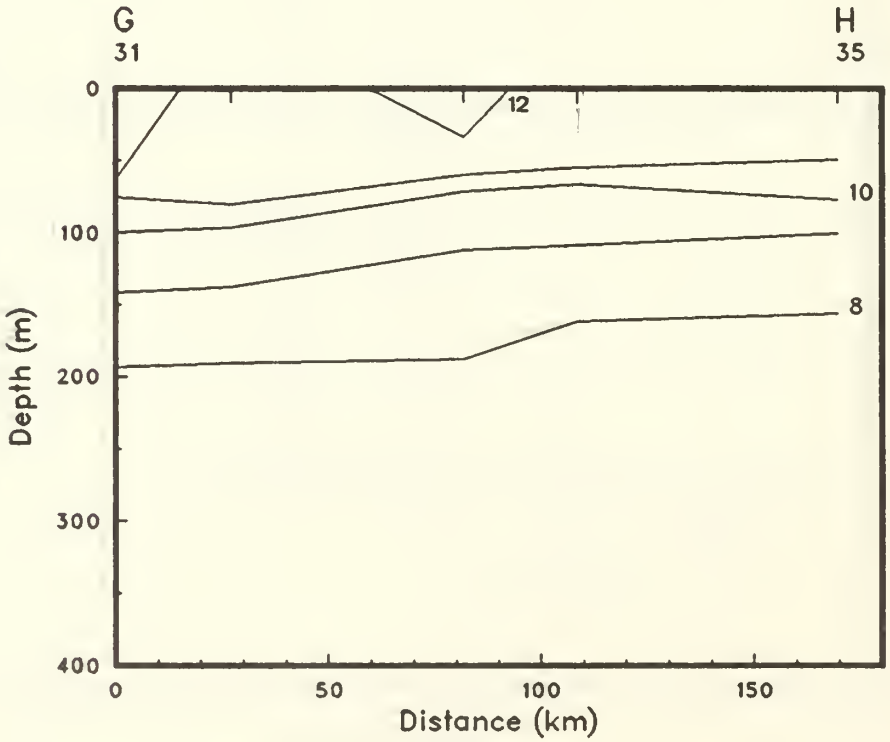

Figure 19(g)

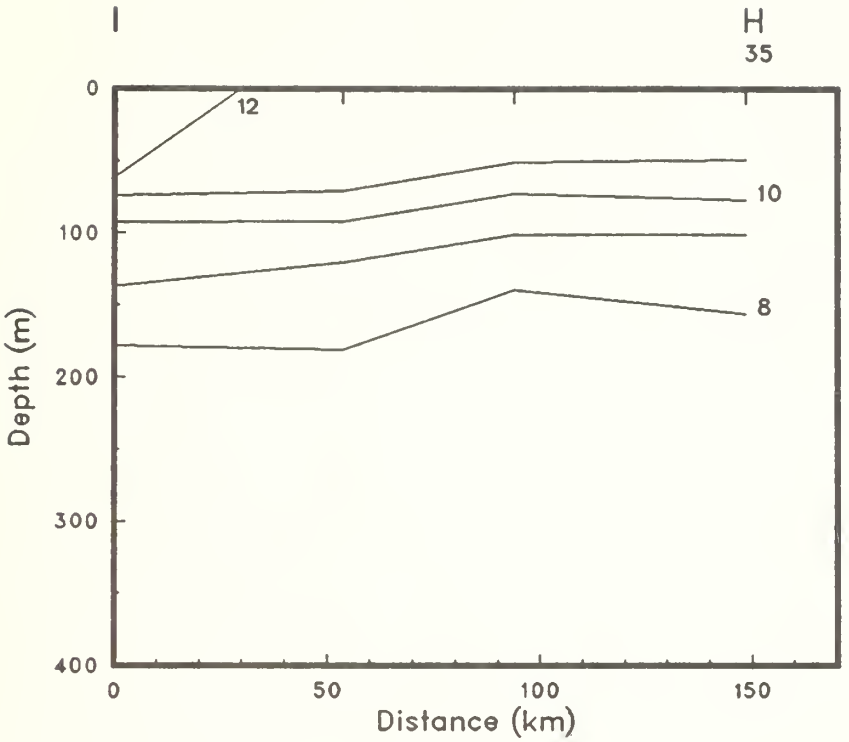

Figure 19(h)

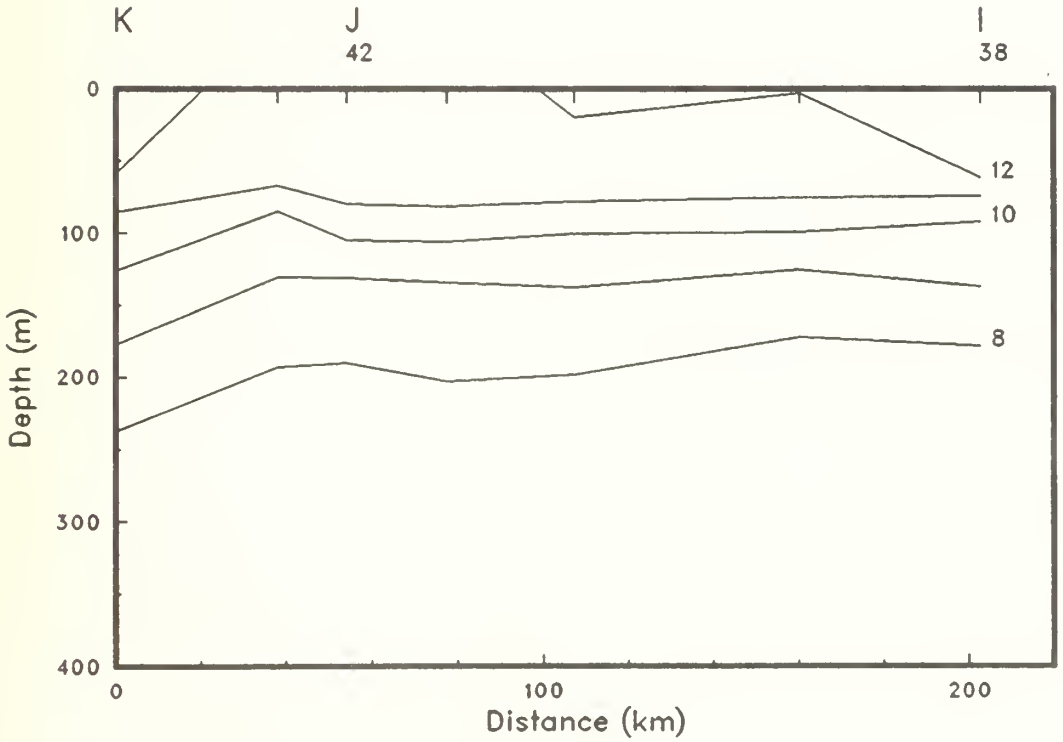

Figure 19(i)

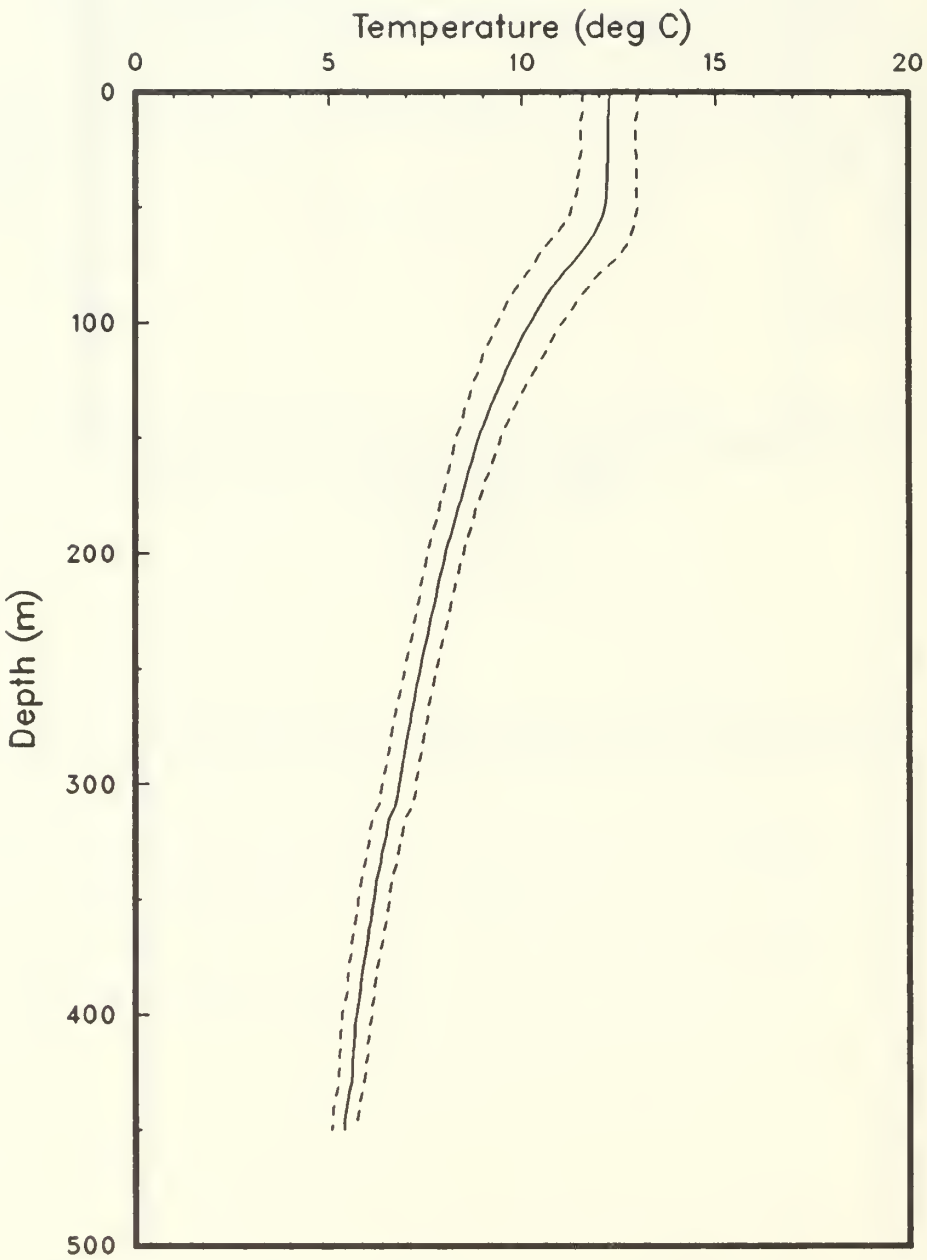

Figure 20: Mean temperature profile, with + and - the standard deviation (OPTOMA15, Leg P).

Section 3

OPTOMA15 Leg DII

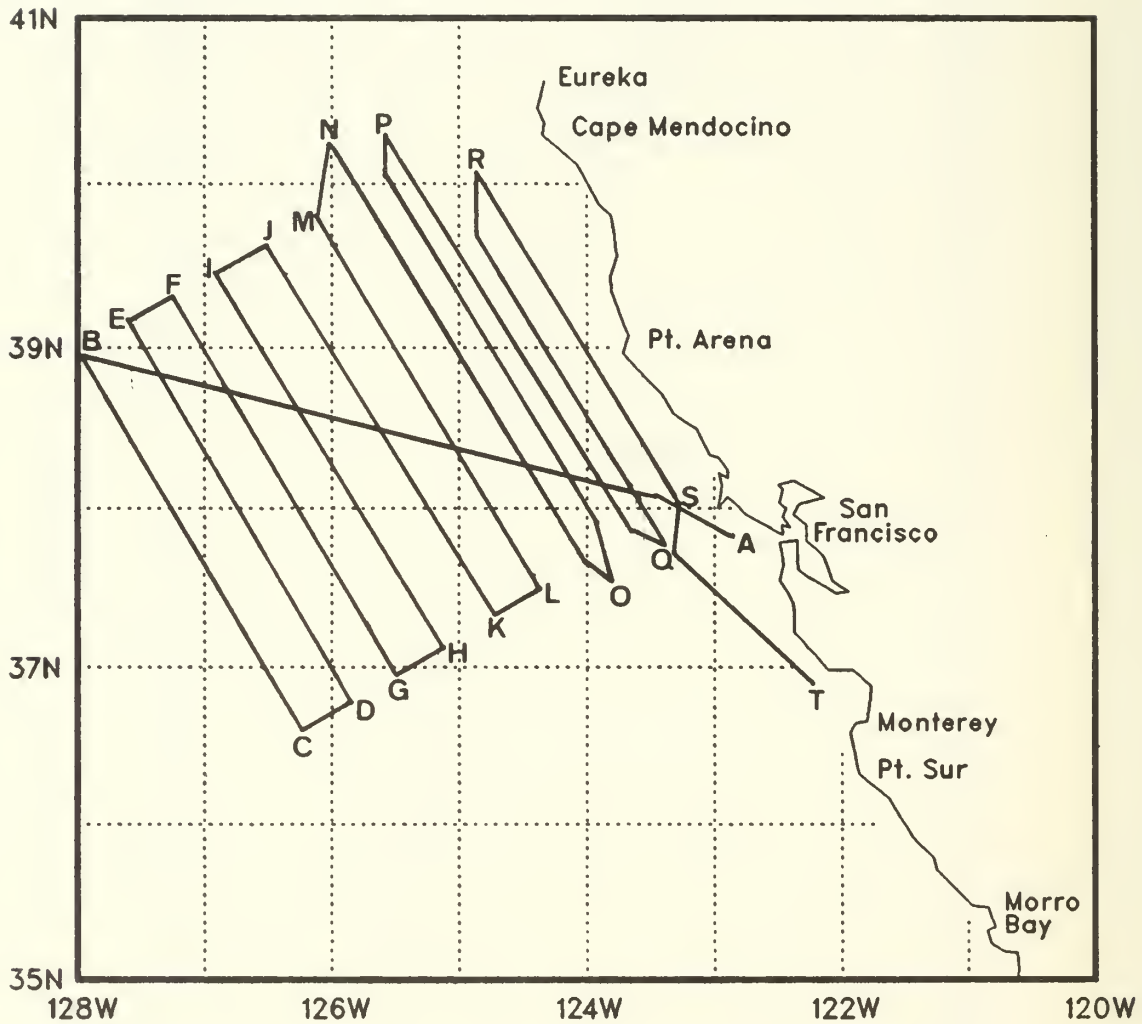

Figure 21: The cruise track for OPTOMA15, Leg DII.

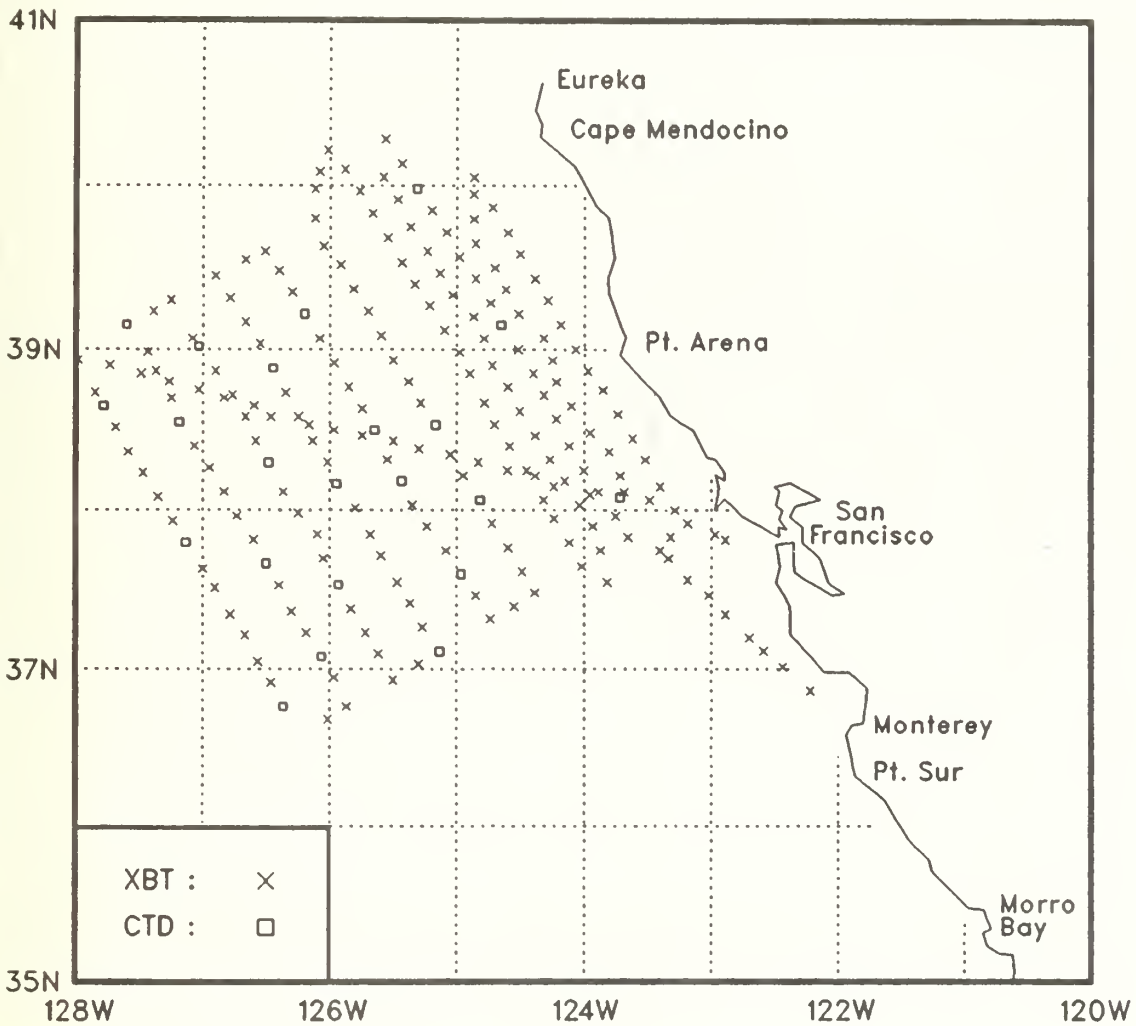

Figure 22: XBT and CTD locations for OPTOMA15, Leg DII.

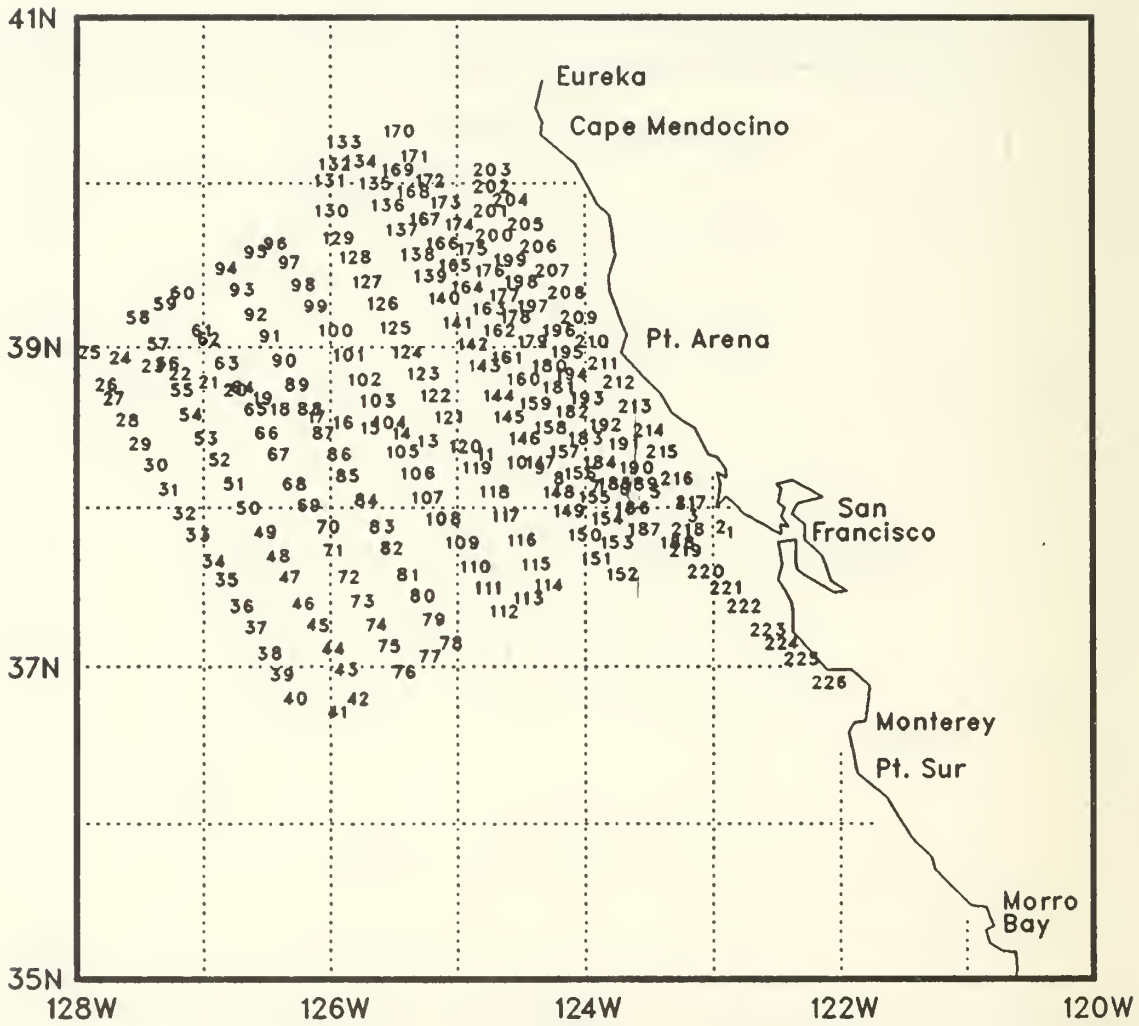

Figure 23: Station numbers for OPTOMA15, Leg DII.

Table 4: Leg DII Station Listing

STN	TYPE	YR/DAY	GMT	LAT (NORTH) (DD.MM)	LONG (WEST) (DDD.MM)	SURFACE TEMP (DEG C)	SURFACE SALINITY (PPT)	BUCKET TEMP (DEG C)	BOTTLE SALINITY (PPT)
1	XBT	85040	253	37.49	122.53	11.6			
2	XBT	85040	318	37.51	122.58	11.7			
3	XBT	85040	432	37.55	123.11	11.1			
4	XBT	85040	528	38.00	123.17	10.9			
5	XBT	85040	646	38.04	123.29	11.0			
6	CTD	85040	903	38.05	123.43	11.3	33.16	11.5	33.18
7	XBT	85040	1109	38.06	123.57	11.3			
8	XBT	85040	1257	38.09	124.14	11.4			
9	XBT	85040	1359	38.13	124.23	11.8			
10	XBT	85040	1531	38.15	124.36	11.9			
11	XBT	85040	1652	38.18	124.50	11.6			
12	XBT	85040	1803	38.21	125.03	11.4			
13	XBT	85040	1925	38.23	125.18	11.3			
14	XBT	85040	2033	38.26	125.30	11.3			
15	XBT	85040	2149	38.28	125.45	11.3			
16	XBT	85040	2253	38.30	125.58	11.5			
17	XBT	85040	2355	38.32	126.10	12.1			
18	XBT	85041	121	38.35	126.28	12.2			
19	XBT	85041	213	38.39	126.36	12.1			
20	XBT	85041	318	38.42	126.50	12.0			
21	XBT	85041	419	38.45	127.02	11.7			
22	XBT	85041	528	38.48	127.16	11.7			
23	XBT	85041	631	38.51	127.29	11.8			
24	XBT	85041	747	38.54	127.44	11.7			
25	XBT	85041	906	38.56	127.59	11.8			
26	XBT	85041	1023	38.44	127.51	11.8			
27	CTD	85041	1140	38.39	127.47	11.7	32.81	11.8	32.83
28	XBT	85041	1331	38.31	127.41	11.8			
29	XBT	85041	1434	38.22	127.35	11.7			
30	XBT	85041	1535	38.14	127.28	11.9			
31	XBT	85041	1642	38.05	127.21	11.5			
32	XBT	85041	1744	37.56	127.14	11.4			
33	CTD	85041	1922	37.48	127.08	11.5	33.07	11.5	33.06
34	XBT	85041	2113	37.38	127.00	11.7			
35	XBT	85041	2208	37.31	126.54	11.6			
36	XBT	85041	2313	37.21	126.47	11.6			
37	XBT	85042	11	37.13	126.40	11.6			
38	XBT	85042	111	37.03	126.34	13.0			
39	XBT	85042	202	36.55	126.28	12.8			
40	CTD	85042	307	36.46	126.22	12.7	32.90	12.8	32.90
41	XBT	85042	611	36.41	126.01	12.8			
42	XBT	85042	706	36.46	125.52	12.9			
43	XBT	85042	811	36.57	125.58	12.4			
44	CTD	85042	925	37.05	126.04	11.6	33.05	11.8	33.07
45	XBT	85042	1056	37.14	126.11	11.7			

STN	TYPE	YR/DAY	GMT	LAT (NORTH) DD.MM	LONG (WEST) DDD.MM	SURFACE TEMP (DEG C)	SURFACE SALINITY (PPT)	BUCKET TEMP (DEG C)	BOTTLE SALINITY (PPT)
46	XBT	85042	1152	37.22	126.18	11.7			
47	XBT	85042	1256	37.32	126.24	11.8			
48	CTD	85042	1409	37.40	126.30	11.4	33.08	11.6	33.10
49	XBT	85042	1616	37.49	126.36	11.6			
50	XBT	85042	1716	37.58	126.44	11.4			
51	XBT	85042	1824	38.07	126.50	11.4			
52	XBT	85042	1922	38.16	126.57	11.8			
53	XBT	85042	2027	38.24	127.04	11.5			
54	CTD	85042	2152	38.33	127.11	11.9	32.78	12.0	32.80
55	XBT	85042	2330	38.42	127.15	11.7			
56	XBT	85043	39	38.52	127.22	12.1			
57	XBT	85043	135	38.59	127.26	12.3			
58	CTD	85043	257	39.09	127.36	11.9	32.76	12.1	32.79
59	XBT	85043	517	39.14	127.23	12.1			
60	XBT	85043	556	39.18	127.15	12.0			
61	XBT	85043	725	39.04	127.05	12.0			
62	CTD	85043	802	39.01	127.02	11.7	32.80	11.9	32.80
63	XBT	85043	1022	38.52	126.54	11.9			
64	XBT	85043	1130	38.43	126.46	11.8			
65	XBT	85043	1223	38.35	126.40	12.1			
66	XBT	85043	1325	38.26	126.35	11.6			
67	CTD	85043	1430	38.18	126.29	11.4	32.81	11.5	32.81
68	XBT	85043	1628	38.07	126.22	11.8			
69	XBT	85043	1727	37.59	126.15	11.4			
70	XBT	85043	1825	37.51	126.06	11.5			
71	XBT	85043	1924	37.42	126.03	11.5			
72	CTD	85043	2239	37.32	125.56	11.9	33.19	12.0	33.19
73	XBT	85044	131	37.23	125.50	11.9			
74	XBT	85044	225	37.14	125.43	11.8			
75	XBT	85044	318	37.06	125.37	12.1			
76	XBT	85044	428	36.56	125.30	11.6			
77	XBT	85044	542	37.02	125.18	11.7			
78	CTD	85044	709	37.07	125.08	11.7	32.97	11.7	33.01
79	XBT	85044	856	37.16	125.16	11.7			
80	XBT	85044	959	37.25	125.22	11.7			
81	XBT	85044	1102	37.33	125.28	11.9			
82	XBT	85044	1213	37.43	125.36	11.9			
83	XBT	85044	1315	37.51	125.41	11.8			
84	XBT	85044	1427	38.01	125.48	12.0			
85	CTD	85044	1703	38.10	125.57	11.6	33.20	11.6	33.21
86	XBT	85044	1916	38.18	126.01	11.3			
87	XBT	85044	2016	38.26	126.08	11.8			
88	XBT	85044	2117	38.35	126.15	12.3			
89	XBT	85044	2228	38.44	126.21	12.5			
90	CTD	85044	1	38.53	126.27	12.0	32.77	12.1	*

STN	TYPE	YR/DAY	GMT	LAT (NORTH) DD.MM	LONG (WEST) DDD.MM	SURFACE TEMP (DEG C)	SURFACE SALINITY (PPT)	BUCKET TEMP (DEG C)	BOTTLE SALINITY (PPT)
91	XBT	85045	143	39.02	126.33	12.2			
92	XBT	85045	242	39.10	126.40	12.5			
93	XBT	85045	343	39.19	126.47	12.3			
94	XBT	85045	443	39.27	126.54	11.1			
95	XBT	85045	557	39.33	126.40	12.0			
96	XBT	85045	639	39.36	126.31	11.9			
97	XBT	85045	735	39.29	126.24	12.1			
98	XBT	85045	834	39.21	126.18	12.0			
99	CTD	85045	951	39.13	126.12	11.8	32.79	11.9	*
100	XBT	85045	1107	39.04	126.05	11.8			
101	XBT	85045	1210	38.55	125.58	12.1			
102	XBT	85045	1327	38.46	125.51	12.1			
103	XBT	85045	1339	38.38	125.45	11.9			
104	CTD	85045	1700	38.30	125.39	11.7	33.31	11.8	*
105	XBT	85045	1902	38.19	125.33	11.8			
106	CTD	85045	2019	38.11	125.26	11.8	33.25	12.1	*
107	XBT	85045	2322	38.02	125.21	11.9			
108	XBT	85046	18	37.54	125.14	12.0			
109	XBT	85046	123	37.45	125.05	11.7			
110	CTD	85046	225	37.36	124.58	11.9	33.14	12.0	*
111	XBT	85046	356	37.28	124.51	12.0			
112	XBT	85046	501	37.19	124.44	11.6			
113	XBT	85046	602	37.24	124.33	11.7			
114	XBT	85046	659	37.29	124.23	11.7			
115	XBT	85046	809	37.37	124.29	11.8			
116	XBT	85046	922	37.46	124.36	11.9			
117	XBT	85046	1039	37.55	124.43	11.9			
118	CTD	85046	1159	38.04	124.49	11.6	33.11	11.8	*
119	XBT	85046	1447	38.13	124.57	12.1			
120	XBT	85046	1543	38.21	125.03	12.0			
121	CTD	85046	1753	38.32	125.10	11.3	32.86	10.9	*
122	XBT	85046	2011	38.40	125.17	11.4			
123	XBT	85046	2153	38.48	125.23	11.9			
124	XBT	85046	2352	38.56	125.30	11.8			
125	XBT	85047	206	39.05	125.36	11.8			
126	XBT	85047	446	39.14	125.42	12.1			
127	XBT	85047	705	39.22	125.49	12.0			
128	XBT	85047	906	39.31	125.55	11.2			
129	XBT	85047	1125	39.38	126.03	11.2			
130	XBT	85047	1450	39.48	126.07	11.7			
131	XBT	85047	1844	39.59	126.07	11.3			
132	XBT	85047	2133	40.05	126.05	11.3			
133	XBT	85048	109	40.13	126.01	11.4			
134	XBT	85048	306	40.06	125.53	11.3			
135	XBT	85048	413	39.58	125.46	10.8			

STN	TYPE	YR/DAY	GMT	LAT (NORTH) DD.MM	LONG (WEST) DDD.MM	SURFACE TEMP (DEG C)	SURFACE SALINITY (PPT)	BUCKET TEMP (DEG C)	BOTTLE SALINITY (PPT)
136	XBT	85048	517	39.50	125.40	10.8			
137	XBT	85048	627	39.41	125.33	10.7			
138	XBT	85048	727	39.32	125.26	11.1			
139	XBT	85048	828	39.24	125.20	11.0			
140	XBT	85048	927	39.16	125.13	11.1			
141	XBT	85048	1030	39.07	125.06	11.5			
142	XBT	85048	1127	38.59	124.59	11.3			
143	XBT	85048	1230	38.51	124.54	11.5			
144	XBT	85048	1348	38.40	124.47	11.4			
145	XBT	85048	1451	38.32	124.42	11.4			
146	XBT	85048	1550	38.24	124.35	11.7			
147	XBT	85048	1703	38.15	124.27	11.6			
148	XBT	85048	1832	38.04	124.19	11.6			
149	XBT	85048	1927	37.57	124.14	11.4			
150	XBT	85048	2030	37.48	124.07	11.1			
151	XBT	85048	2138	37.39	124.01	11.1			
152	XBT	85048	2258	37.33	123.49	11.3			
153	XBT	85049	336	37.45	123.52	11.6			
154	XBT	85049	632	37.54	123.56	11.2			
155	XBT	85049	851	38.02	124.02	11.5			
156	XBT	85049	1127	38.11	124.09	11.1			
157	XBT	85049	1343	38.19	124.16	11.4			
158	XBT	85049	1531	38.28	124.23	11.6			
159	XBT	85049	1711	38.37	124.30	11.1			
160	XBT	85049	1836	38.46	124.36	11.1			
161	XBT	85049	1955	38.54	124.43	11.3			
162	XBT	85049	2124	39.04	124.47	11.8			
163	XBT	85049	2239	39.12	124.52	10.7			
164	XBT	85050	33	39.20	125.02	10.9			
165	XBT	85050	159	39.28	125.08	11.2			
166	XBT	85050	339	39.36	125.14	11.1			
167	XBT	85050	506	39.45	125.22	10.7			
168	XBT	85050	656	39.55	125.28	11.0			
169	XBT	85050	831	40.03	125.35	10.7			
170	XBT	85050	1119	40.17	125.34	10.9			
171	XBT	85050	1357	40.08	125.26	11.1			
172	CTD	85050	1616	39.59	125.19	10.9	32.78	10.9	*
173	XBT	85050	1746	39.51	125.12	10.9			
174	XBT	85050	1847	39.43	125.05	10.5			
175	XBT	85050	1946	39.34	124.59	10.6			
176	XBT	85050	2039	39.26	124.51	10.4			
177	XBT	85050	2141	39.17	124.44	10.5			
178	CTD	85050	2255	39.09	124.39	10.4	32.91	10.5	*
179	XBT	85051	31	39.00	124.31	11.5			
180	XBT	85051	128	38.51	124.24	11.7			

STN	TYPE	YR/DAY	GMT	LAT (NORTH) DD.MM	LONG (WEST) DDD.MM	SURFACE TEMP (DEG C)	SURFACE SALINITY (PPT)	BUCKET TEMP (DEG C)	BOTTLE SALINITY (PPT)
181	XBT	85051	214	38.43	124.19	11.0			
182	XBT	85051	306	38.34	124.13	11.4			
183	XBT	85051	414	38.24	124.07	11.1			
184	XBT	85051	502	38.15	124.00	10.7			
185	XBT	85051	600	38.07	123.53	11.0			
186	XBT	85051	656	37.58	123.45	10.8			
187	XBT	85051	747	37.50	123.39	11.0			
188	XBT	85051	917	37.45	123.24	10.9			
189	XBT	85051	1927	38.07	123.41	10.6			
190	XBT	85051	2125	38.13	123.43	10.5			
191	XBT	85052	130	38.22	123.48	10.3			
192	XBT	85052	627	38.29	123.57	11.1			
193	XBT	85052	1119	38.39	124.06	10.9			
194	XBT	85052	1456	38.48	124.13	10.8			
195	XBT	85052	1757	38.56	124.15	10.7			
196	XBT	85052	2225	39.04	124.19	10.7			
197	XBT	85053	405	39.13	124.31	10.6			
198	XBT	85053	722	39.22	124.37	10.4			
199	XBT	85053	1017	39.30	124.42	10.7			
200	XBT	85053	1370	39.39	124.51	10.5			
201	XBT	85053	1730	39.48	124.52	10.4			
202	XBT	85053	2019	39.57	124.52	10.4			
203	XBT	85053	2133	40.03	124.52	10.2			
204	XBT	85053	2241	39.52	124.43	10.3			
205	XBT	85053	2341	39.43	124.36	10.1			
206	XBT	85054	30	39.35	124.30	10.4			
207	XBT	85054	117	39.26	124.23	10.4			
208	XBT	85054	206	39.18	124.17	10.5			
209	XBT	85054	257	39.09	124.11	10.9			
210	XBT	85054	300	39.00	124.04	10.8			
211	XBT	85054	442	38.52	123.58	10.3			
212	XBT	85054	528	38.45	123.51	9.4			
213	XBT	85054	621	38.36	123.44	9.6			
214	XBT	85054	718	38.27	123.37	9.5			
215	XBT	85054	801	38.19	123.31	9.8			
216	XBT	85054	902	38.09	123.24	10.0			
217	XBT	85054	1002	38.00	123.17	9.9			
218	XBT	85054	1100	37.50	123.19	10.1			
219	XBT	85054	1139	37.42	123.20	10.4			
220	XBT	85054	1227	37.34	123.11	10.8			
221	XBT	85054	1322	37.28	123.01	11.0			
222	XBT	85054	1411	37.21	122.53	11.3			
223	XBT	85054	1517	37.12	122.42	11.8			
224	XBT	85054	1556	37.07	122.35	11.1			
225	XBT	85054	1647	37.01	122.26	10.9			
226	XBT	85054	1800	36.52	122.13	11.2			

Data not available

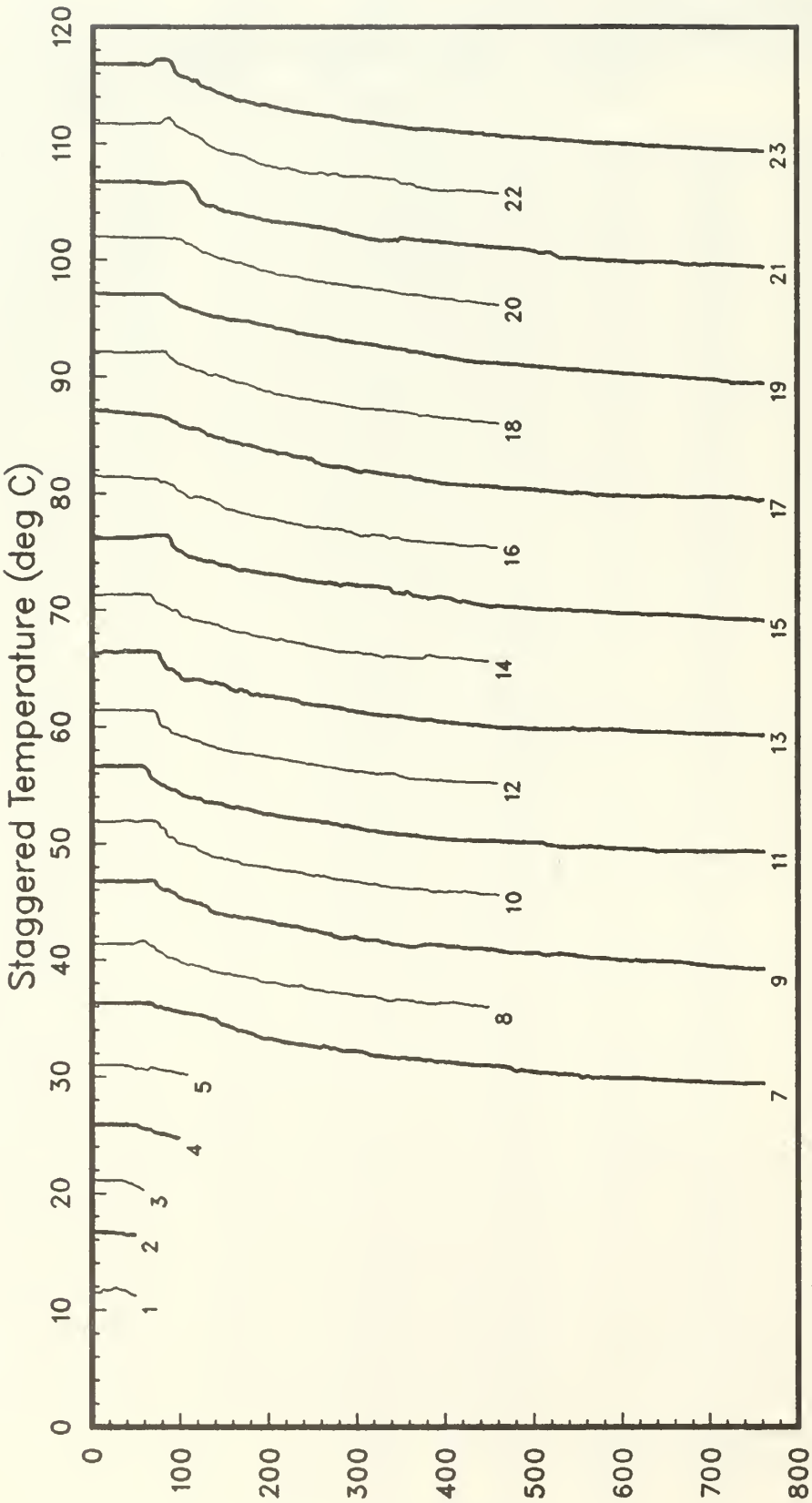

Figure 24(a): XBT temperature profiles, staggered by multiples of 5C (OPTOMA15, Leg DII).

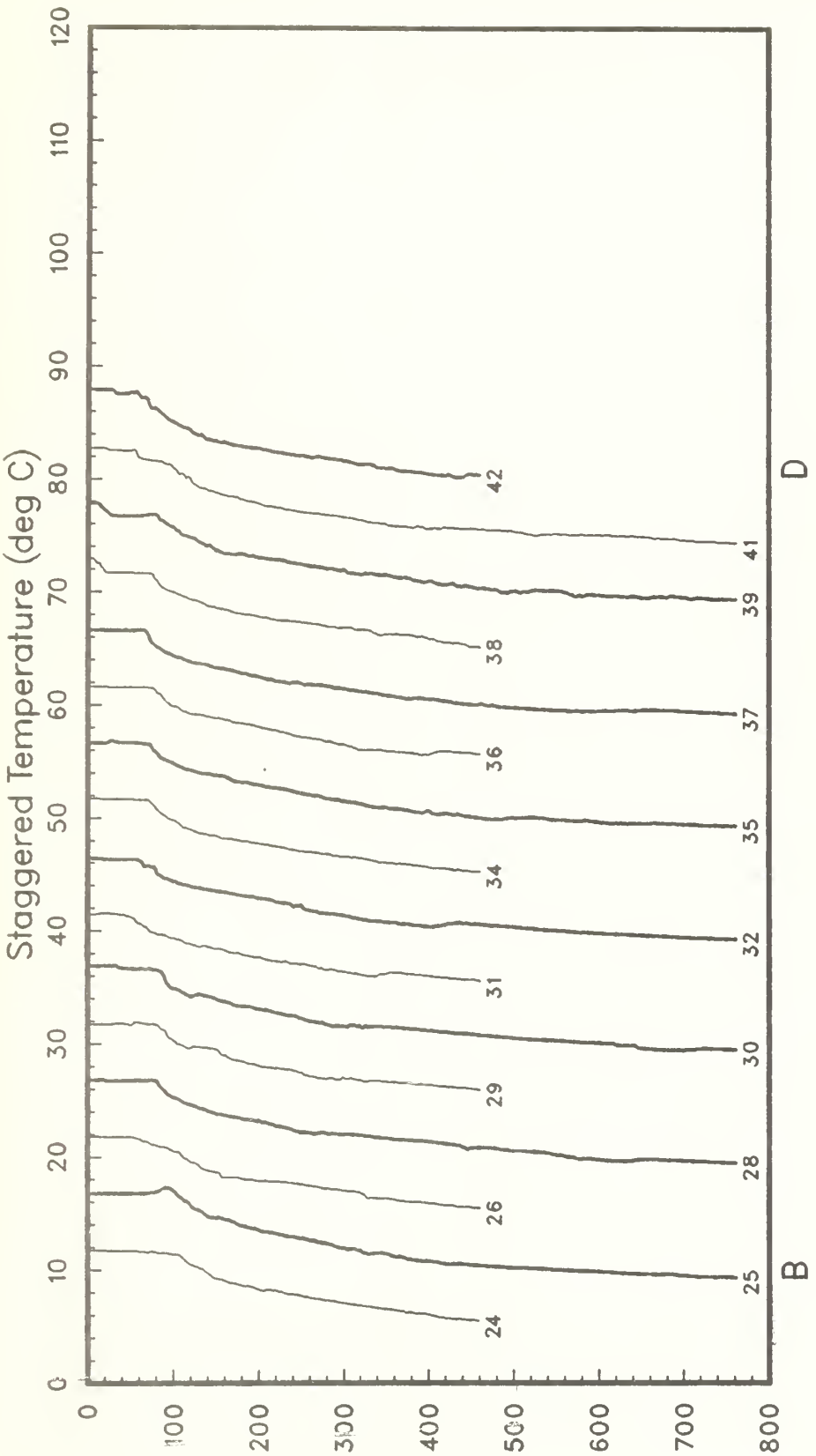
Staggered Temperature (deg C)
Depth (m)
0
10
20
30
40
50
60
70
80
90
100
110
120
0
100
200
300
400
500
600
700
800
24
25
26
28
29
30
31
32
34
35
36
37
38
39
41
42
B
D

Figure 24(b)

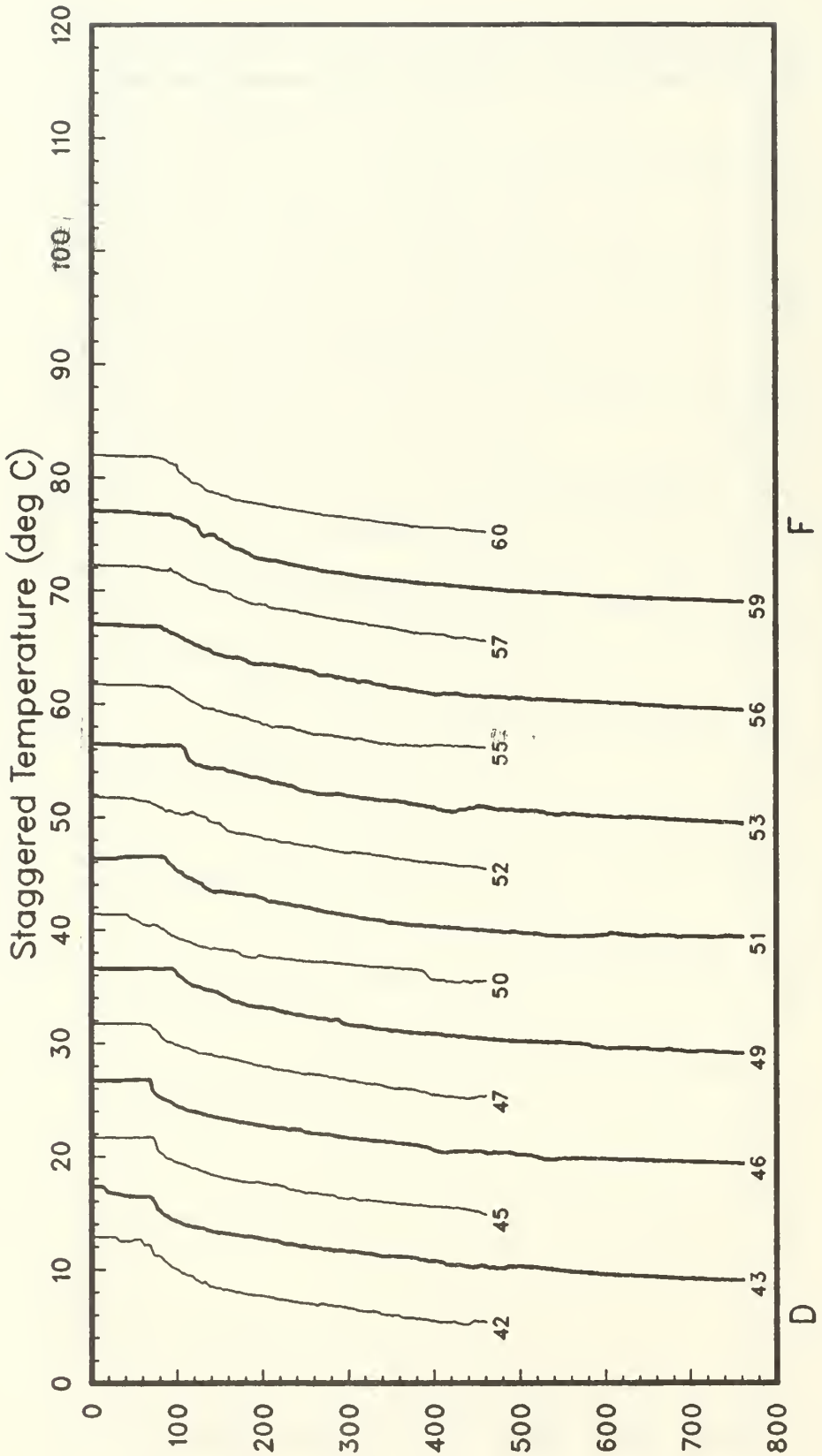
Staggered Temperature (deg C)
Depth (m)
0
10
20
30
40
50
60
70
80
90
100
110
120
0
100
200
300
400
500
600
700
800
42
43
45
46
47
49
50
51
52
53
55
56
57
59
60
D
F

Figure 24(c)

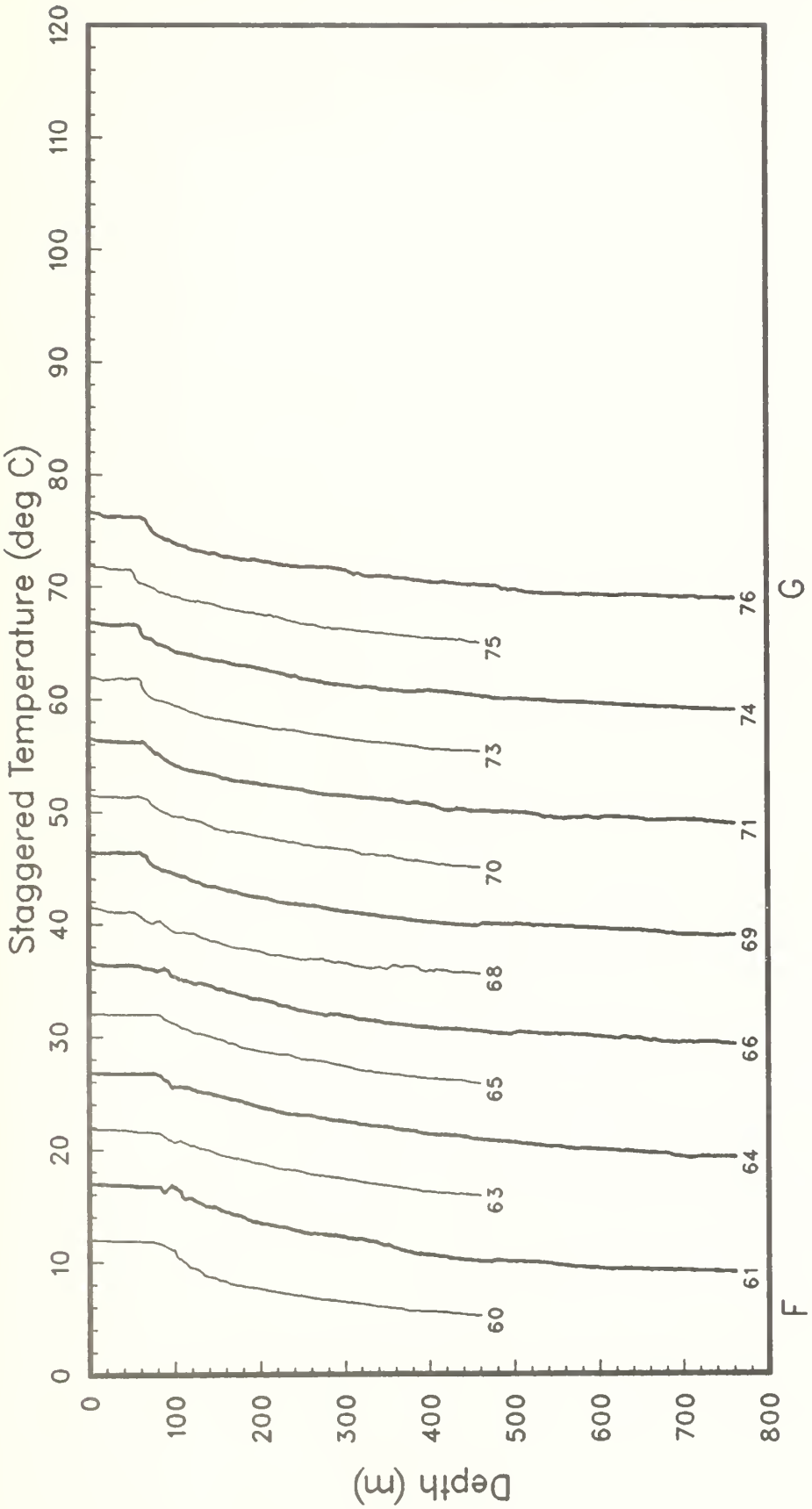
Staggered Temperature (deg C)
Depth (m)
0
10
20
30
40
50
60
70
80
90
100
110
120
0
100
200
300
400
500
600
700
800
60
61
63
64
65
66
68
69
70
71
73
74
75
76
F
G

Figure 24(d)

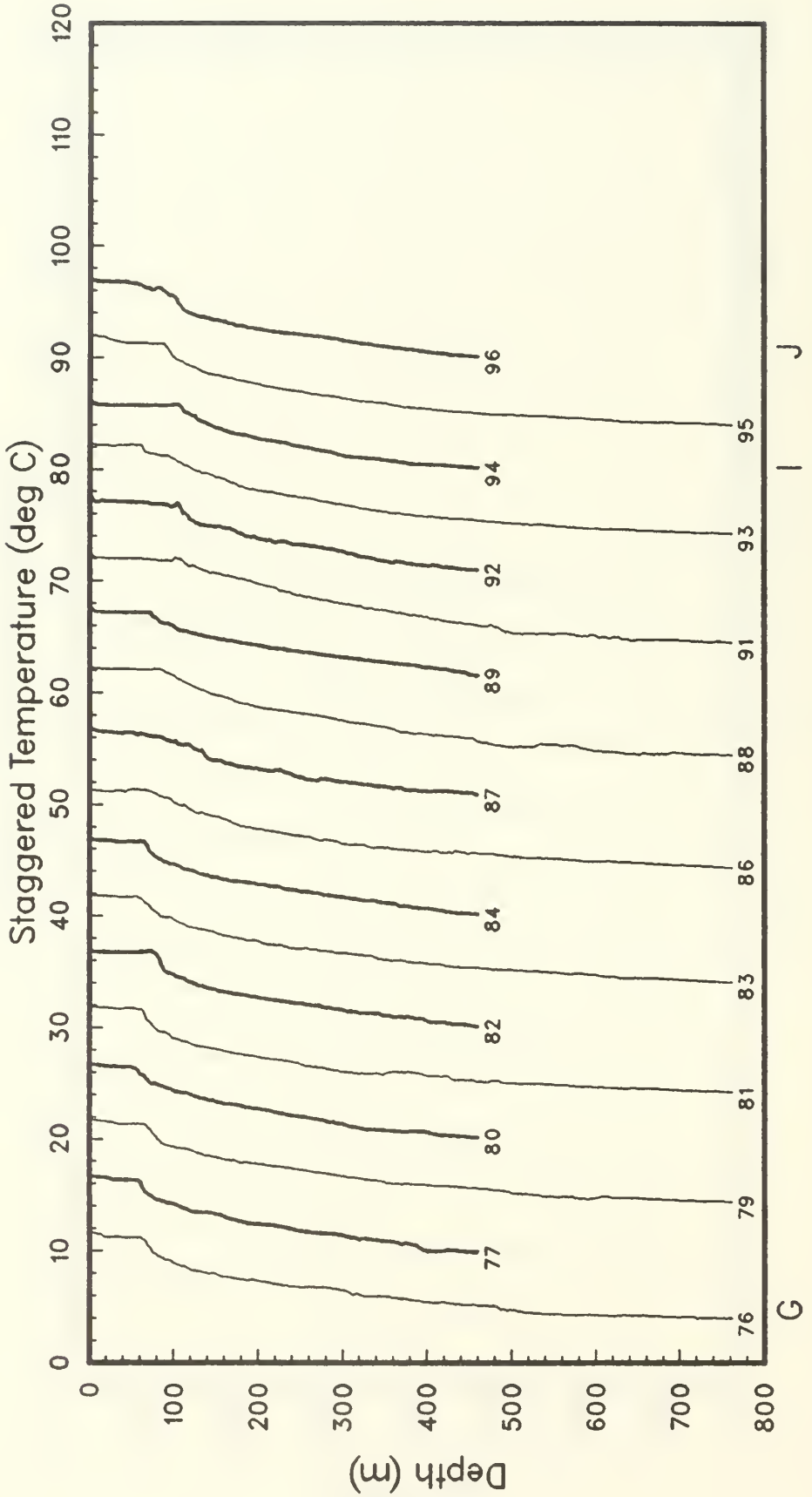
Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (m)
0
100
200
300
400
500
600
700
800
76
77
79
80
81
82
83
84
86
87
88
89
91
92
93
94
95
96
G
I
J

Figure 24(e)

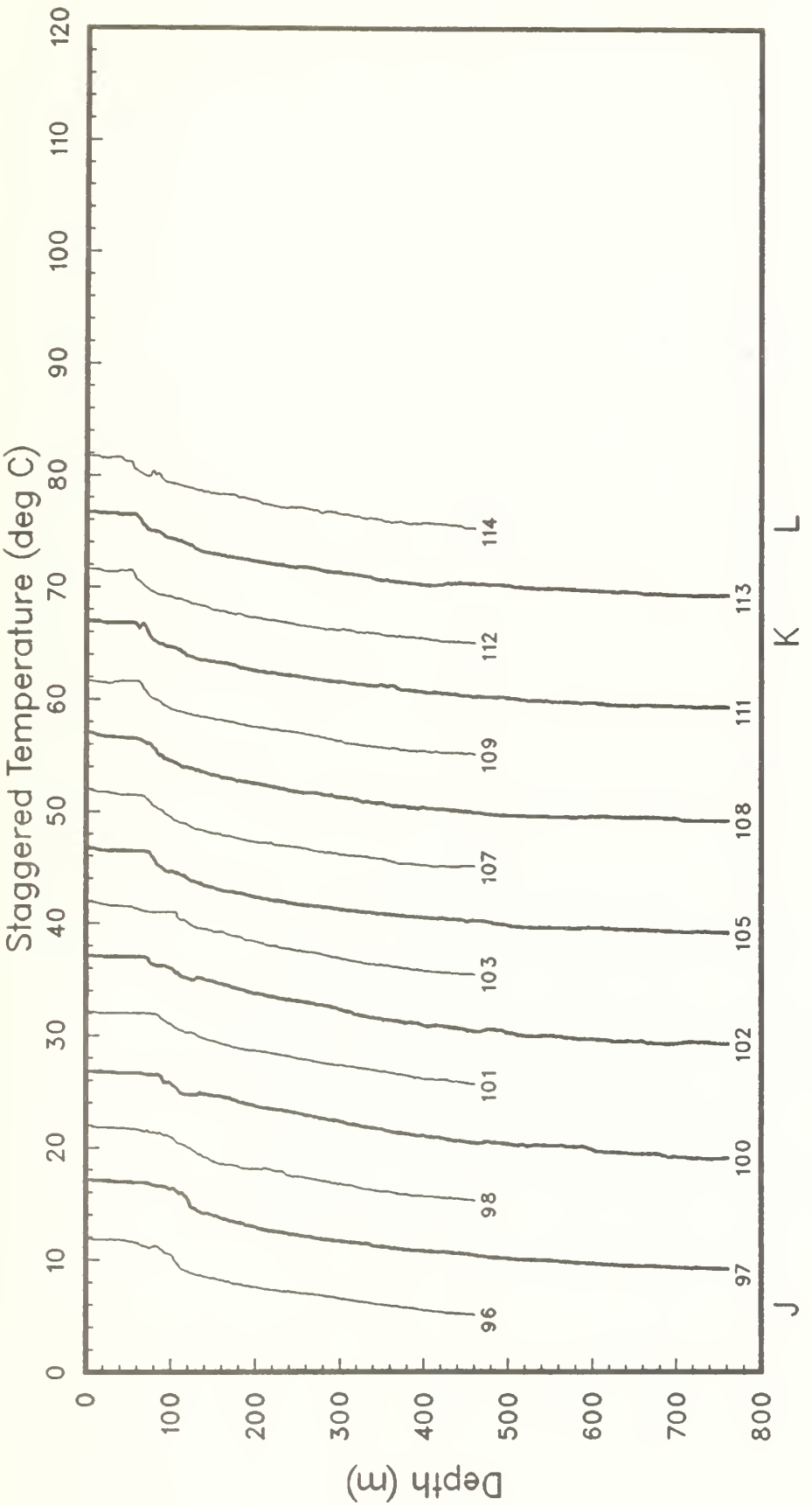
Staggered Temperature (deg C)
Depth (m)
0
10
20
30
40
50
60
70
80
90
100
110
120
0
100
200
300
400
500
600
700
800
96
97
98
100
101
102
103
105
107
108
109
111
112
113
114
J
K
L

Figure 24(f)

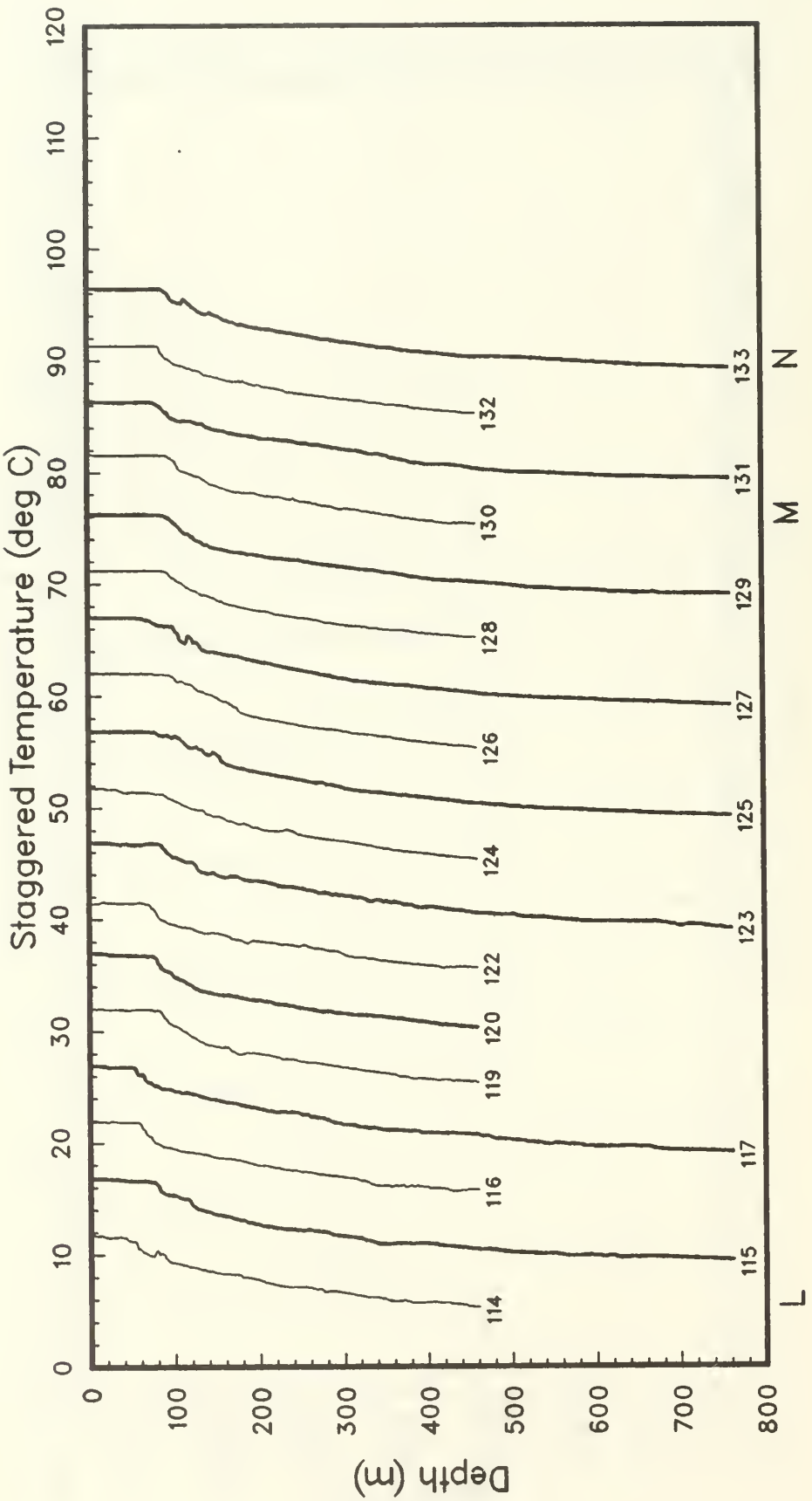
Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (m)
0
100
200
300
400
500
600
700
800
114
115
116
117
119
120
122
123
124
125
126
127
128
129
130
131
132
133
L
M
N

Figure 24(g)

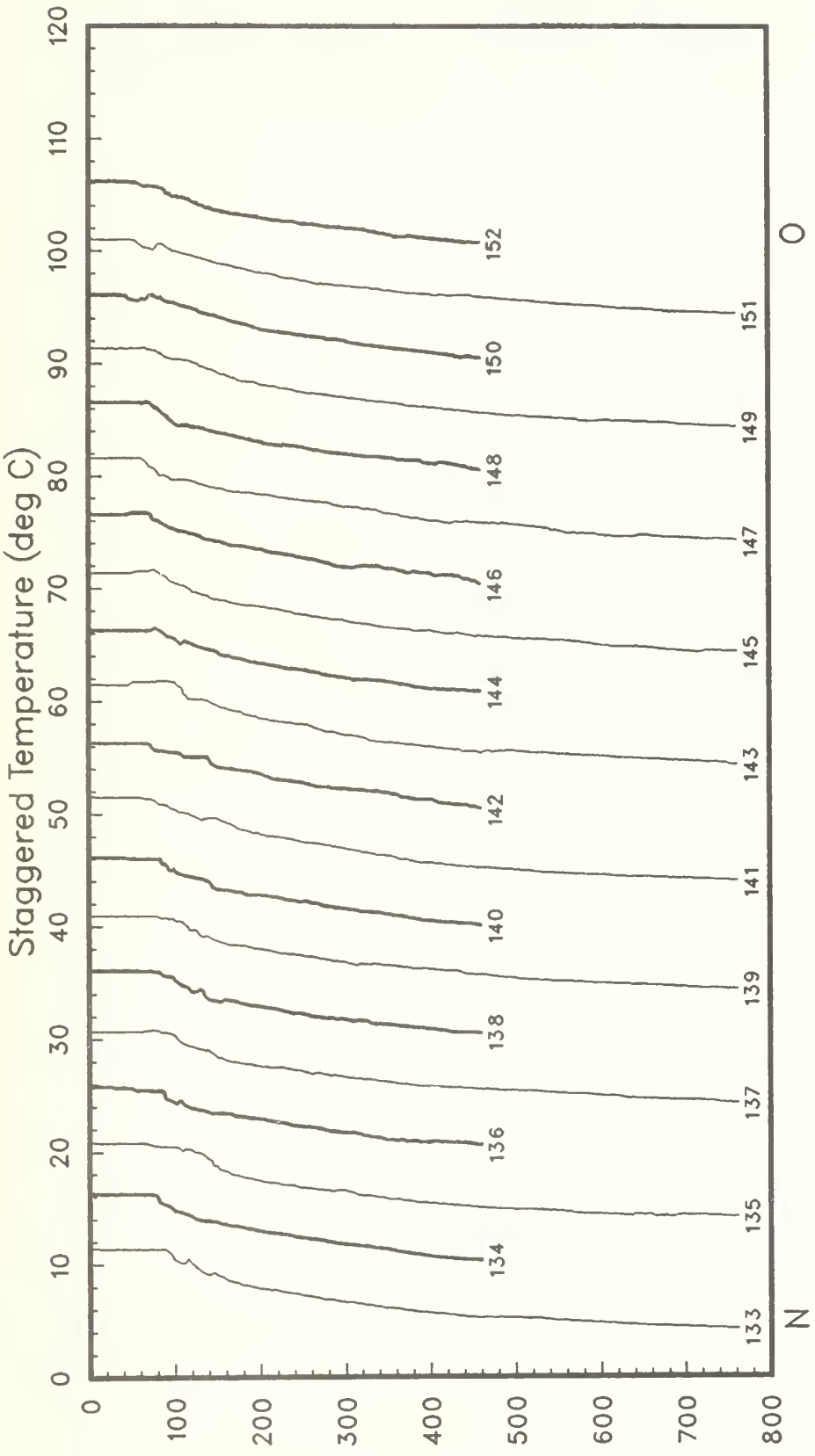
Staggered Temperature (deg C)
Depth (m)
0
100
200
300
400
500
600
700
800
0
10
20
30
40
50
60
70
80
90
100
110
120
133
134
135
136
137
138
139
140
141
142
143
144
145
146
147
148
149
150
151
152
N
O

Figure 24(h)

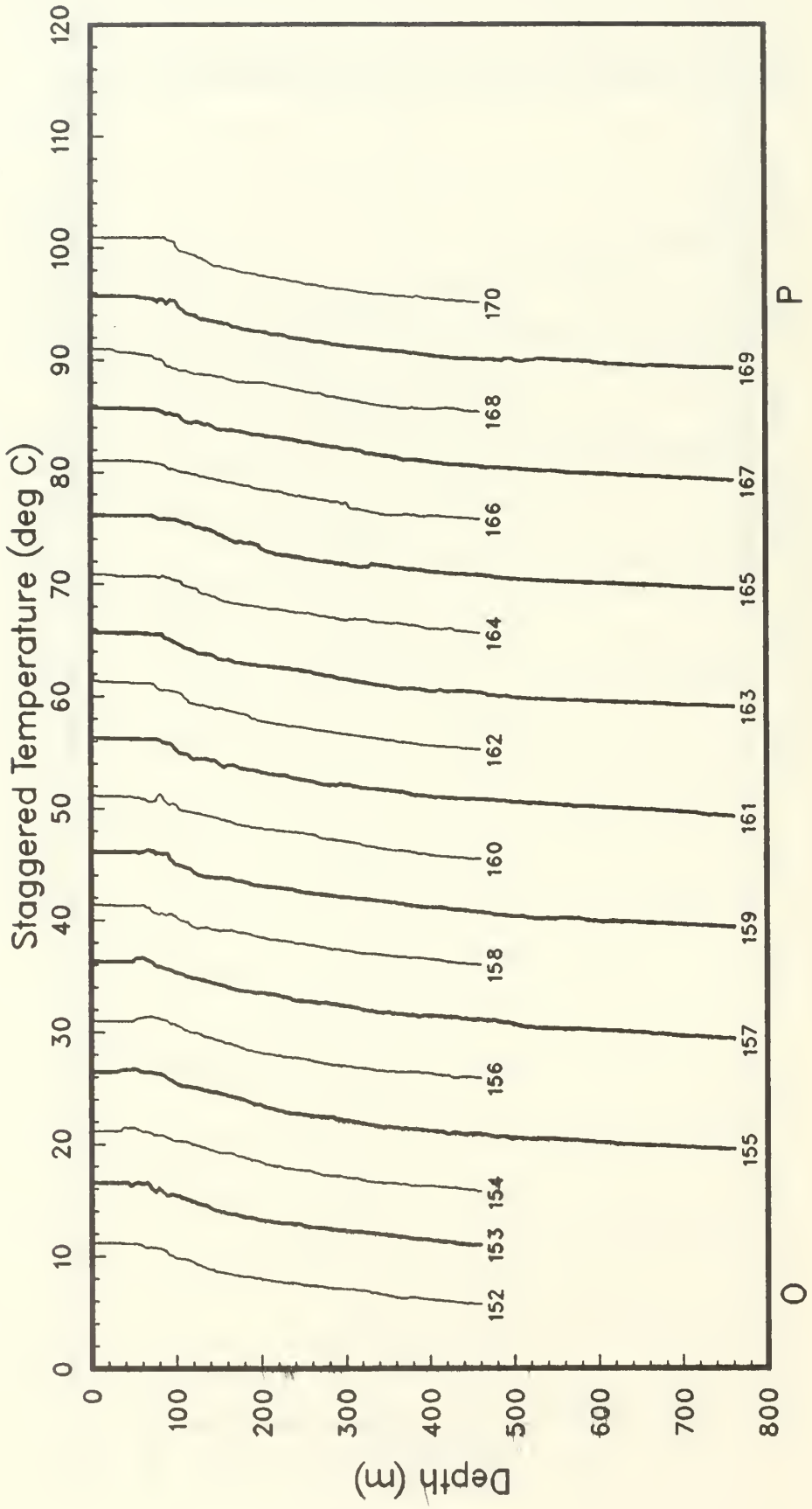
Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (m)
0
100
200
300
400
500
600
700
800
O
P
152
153
154
155
156
157
158
159
160
161
162
163
164
165
166
167
168
169
170

Figure 24(i)

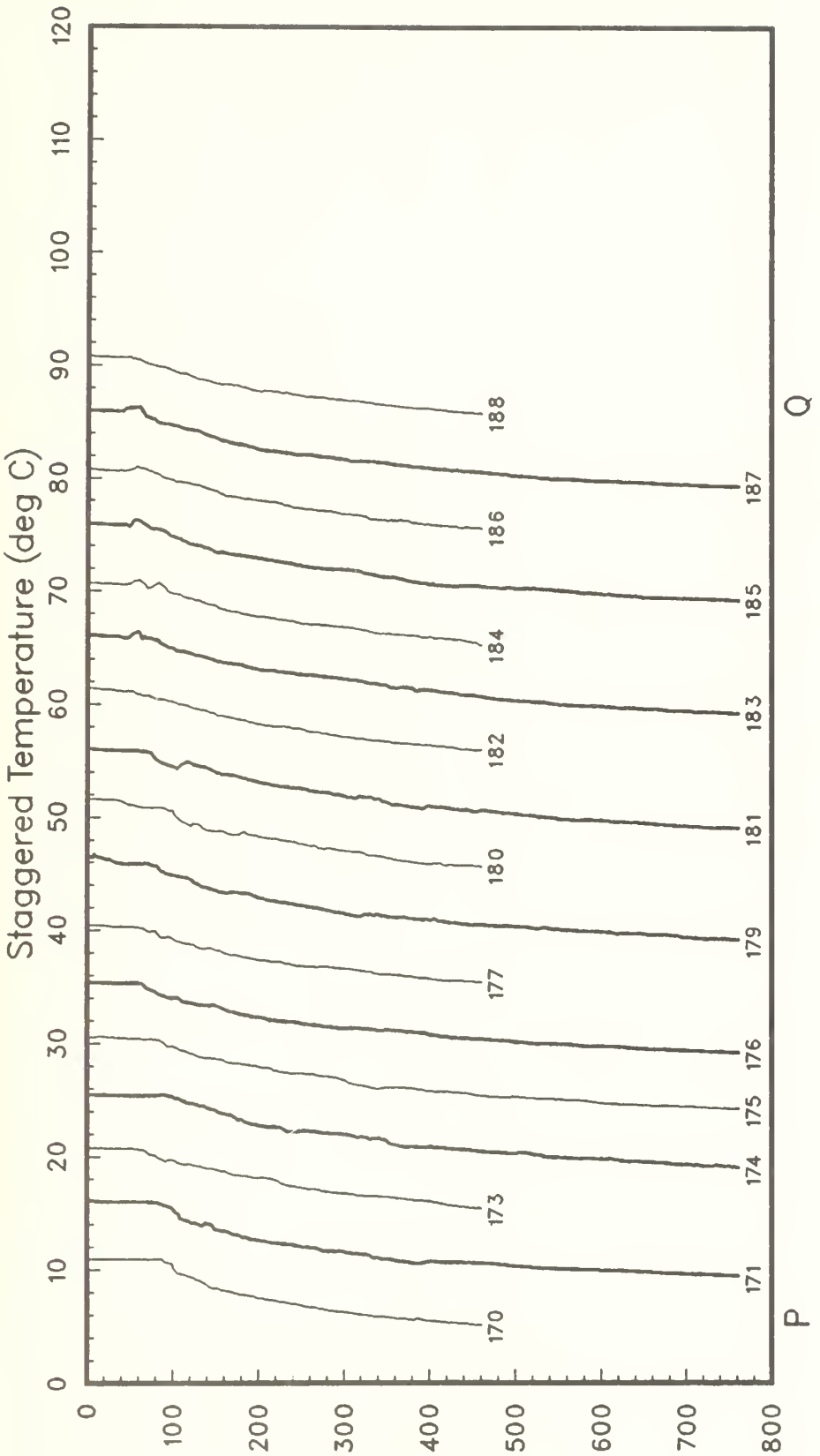
Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (m)
0
100
200
300
400
500
600
700
800
P
Q
170
171
173
174
175
176
177
179
180
181
182
183
184
185
186
187
188

Figure 24(j)

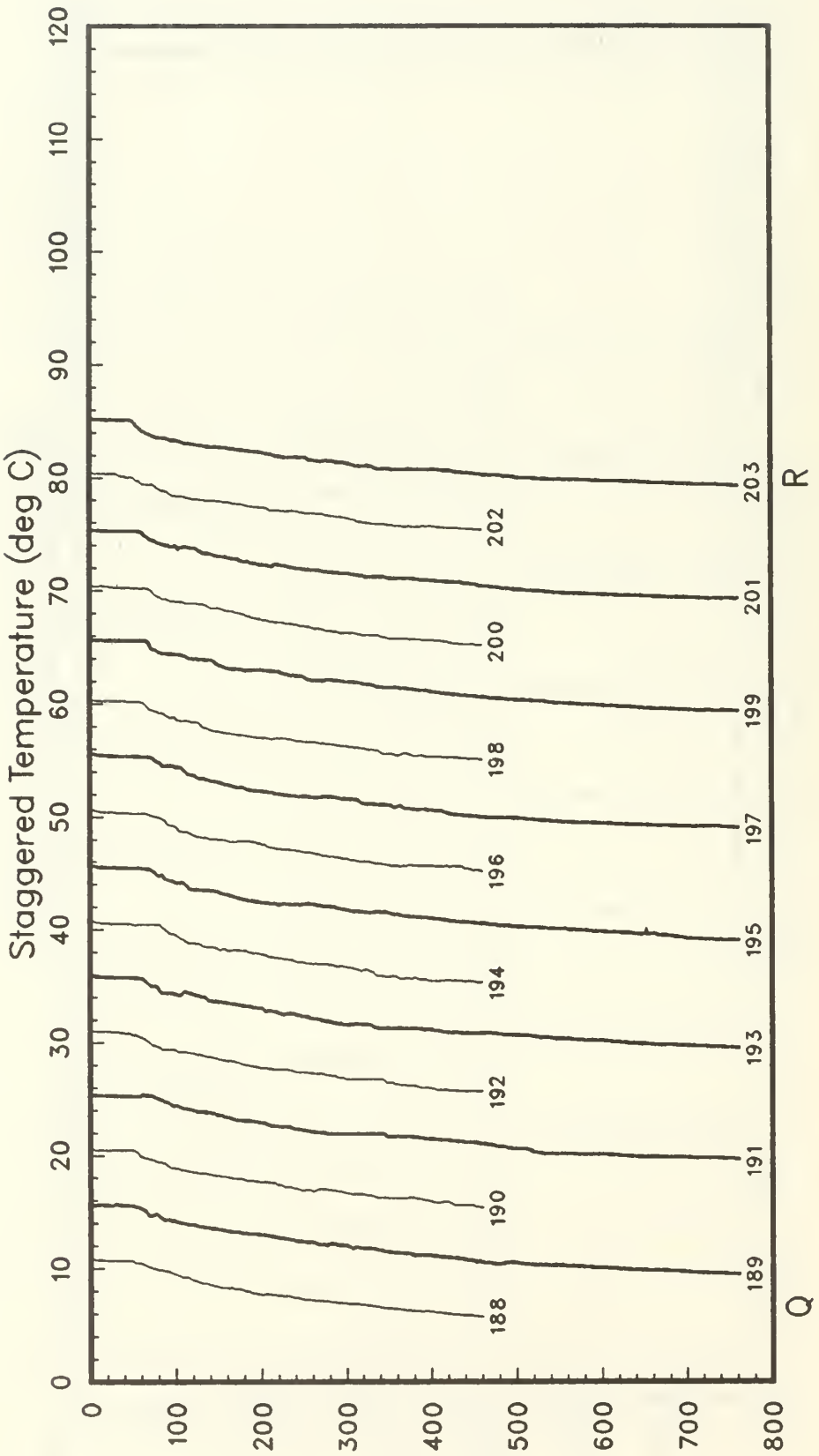
Staggered Temperature (deg C)
Depth (m)
0
10
20
30
40
50
60
70
80
90
100
110
120
0
100
200
300
400
500
600
700
800
188
189
190
191
192
193
194
195
196
197
198
199
200
201
202
203
Q
R

Figure 24(k)

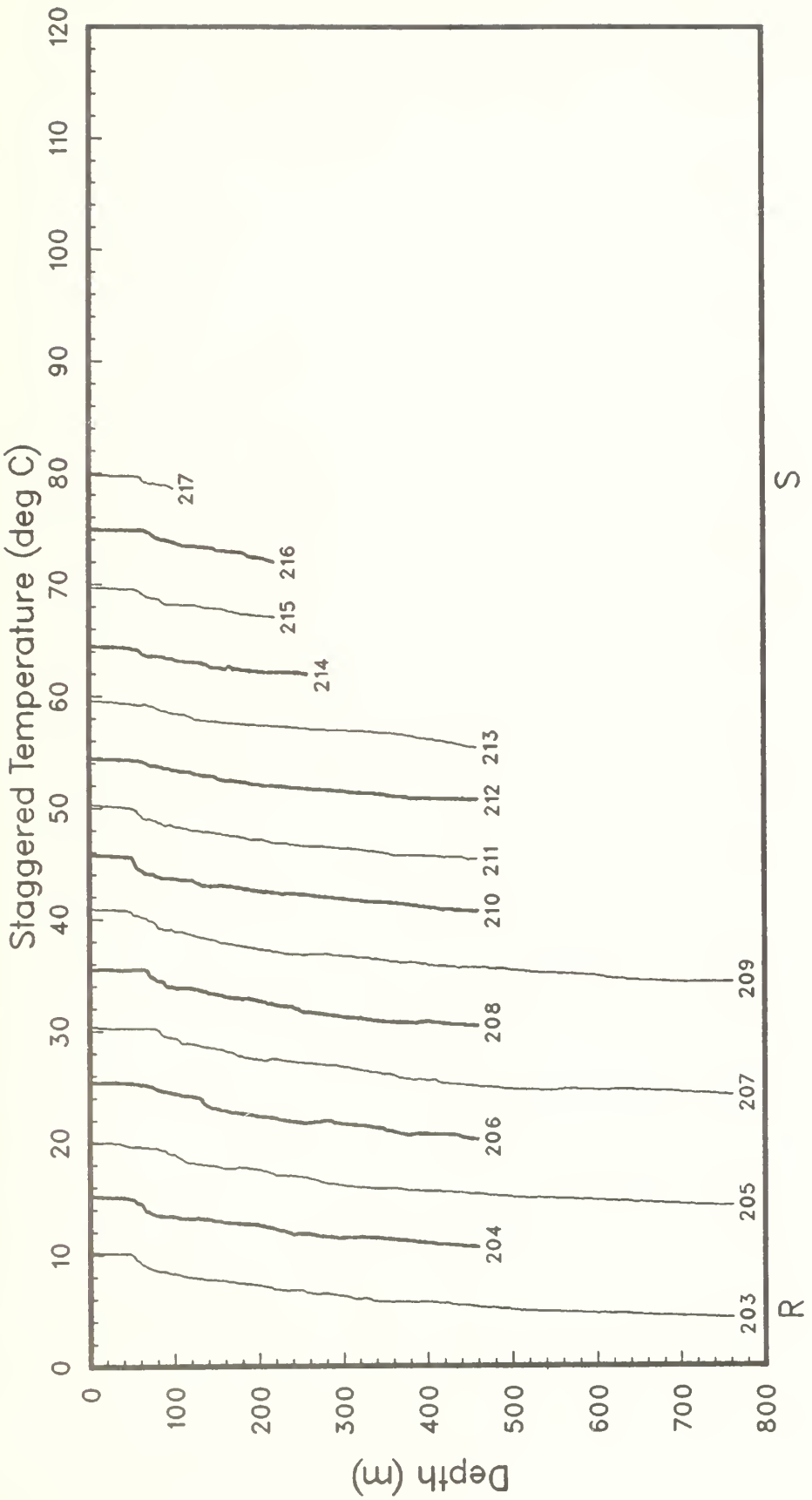
Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (m)
0
100
200
300
400
500
600
700
800
R
S
203
204
205
206
207
208
209
210
211
212
213
214
215
216
217

Figure 24(1)

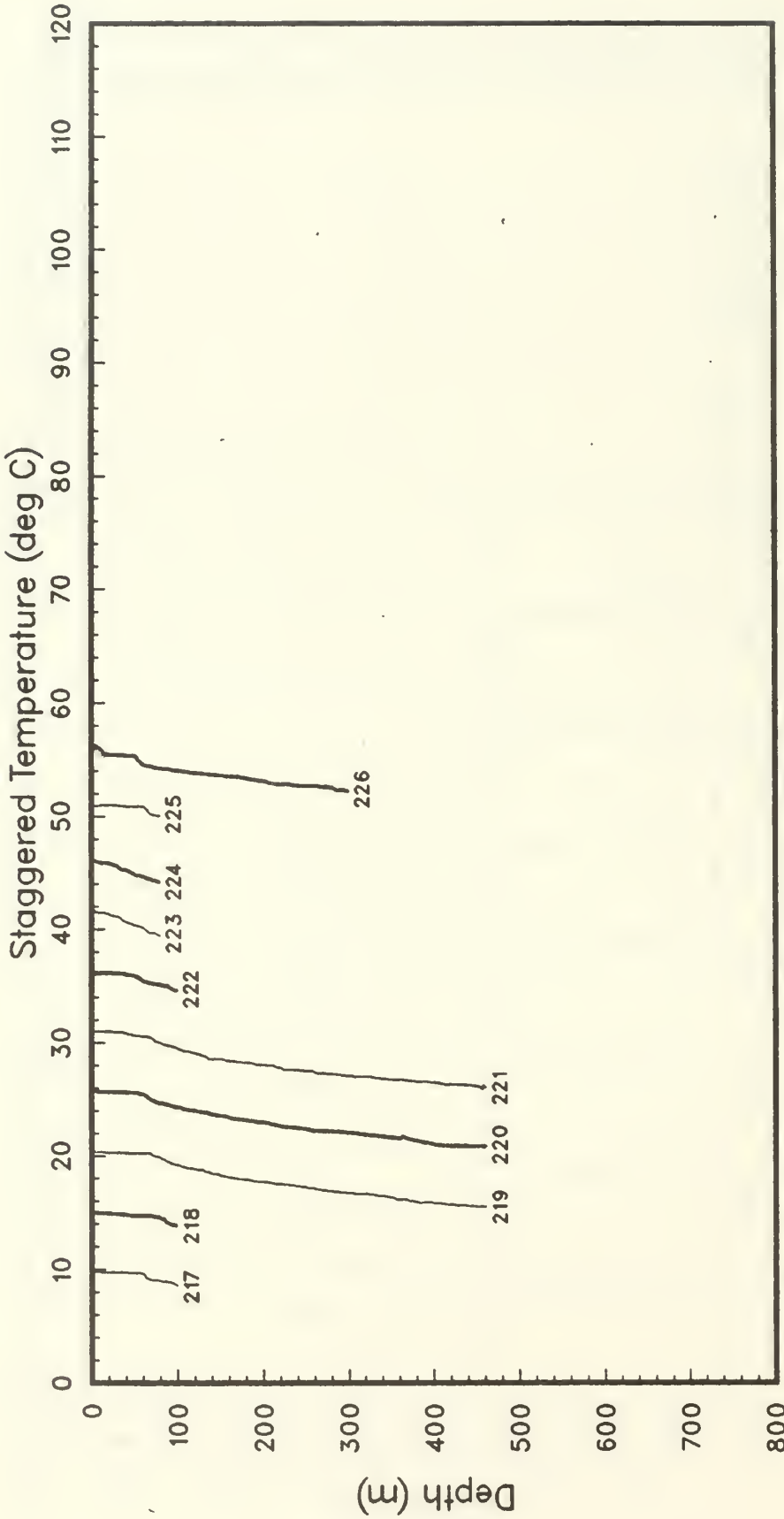
Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (m)
0
100
200
300
400
500
600
700
800
217
218
219
220
221
222
223
224
225
226
S
T

Figure 24(m)

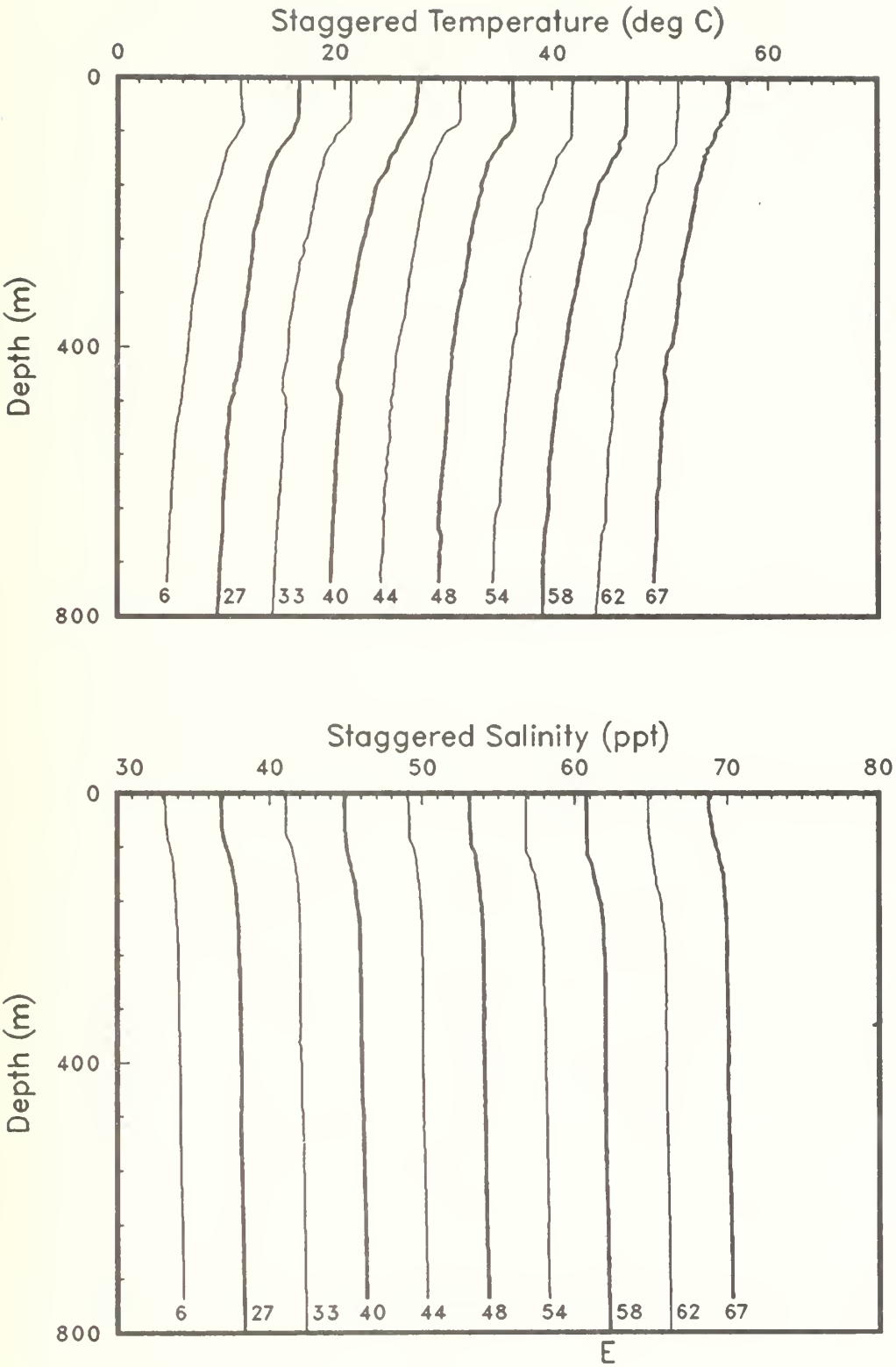

Figure 25(a): CTD temperature profiles, staggered by multiples of 5C, and salinity profiles staggered by multiples of 4 ppt (OPTOMA15, Leg DII).

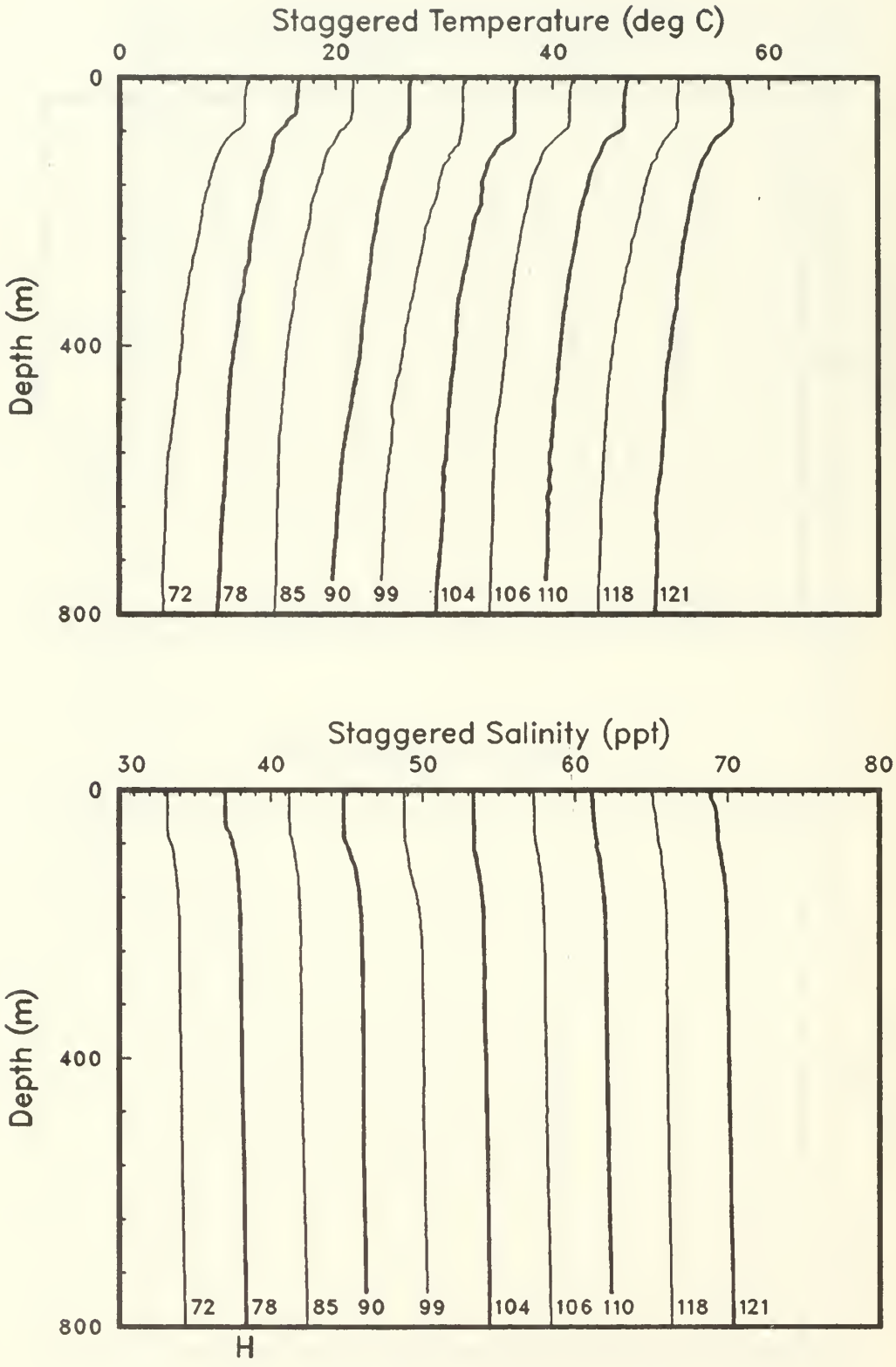
Staggered Temperature (deg C)
0
20
40
60
0
400
800
Depth (m)
72
78
85
90
99
104
106
110
118
121
Staggered Salinity (ppt)
30
40
50
60
70
80
0
400
800
Depth (m)
72
78
85
90
99
104
106
110
118
121
H

Figure 25(b)

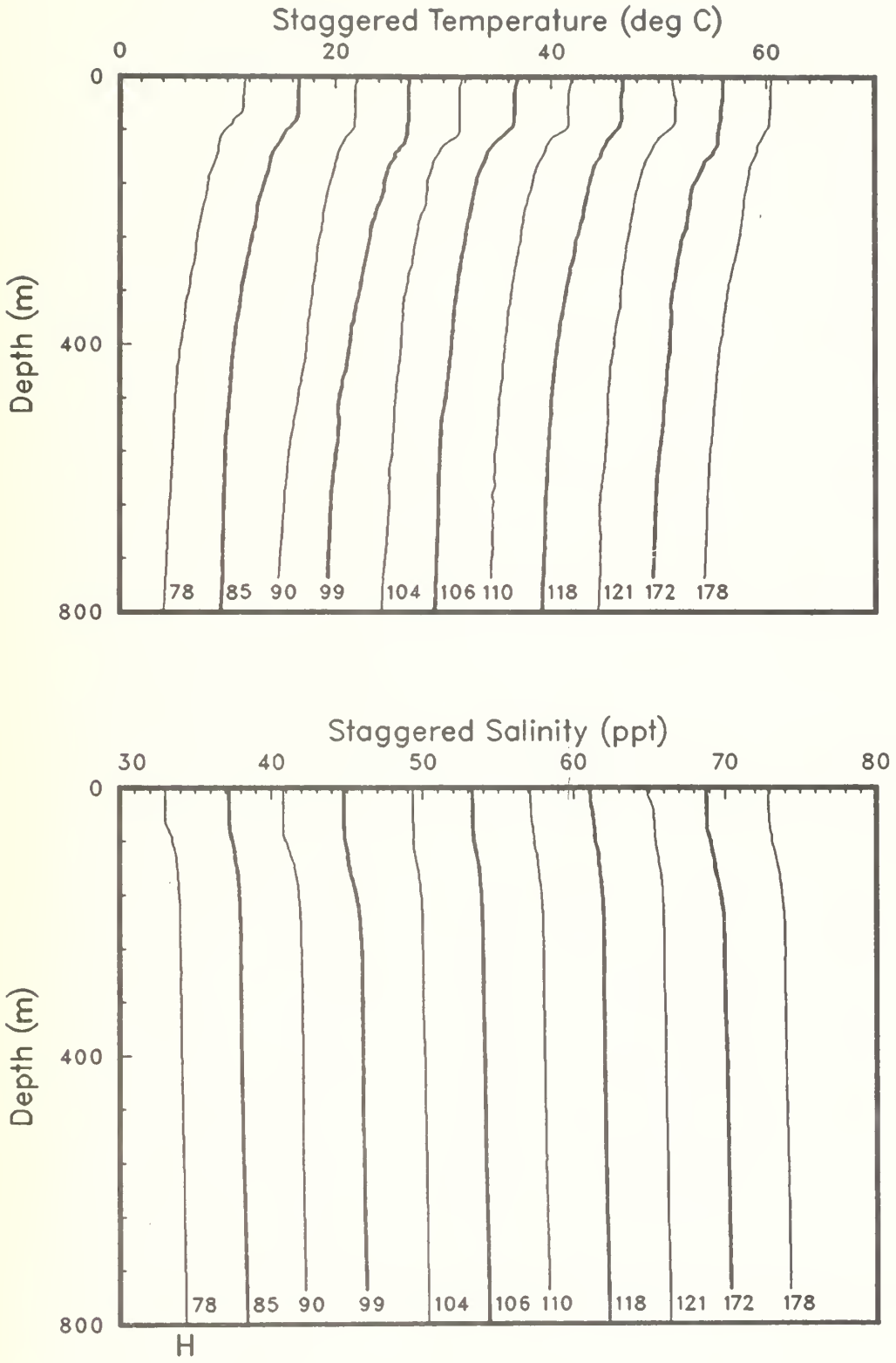
Staggered Temperature (deg C)
0
20
40
60
0
400
800
Depth (m)
78
85
90
99
104
106
110
118
121
172
178
Staggered Salinity (ppt)
30
40
50
60
70
80
0
400
800
Depth (m)
78
85
90
99
104
106
110
118
121
172
178
H

Figure 25(c)

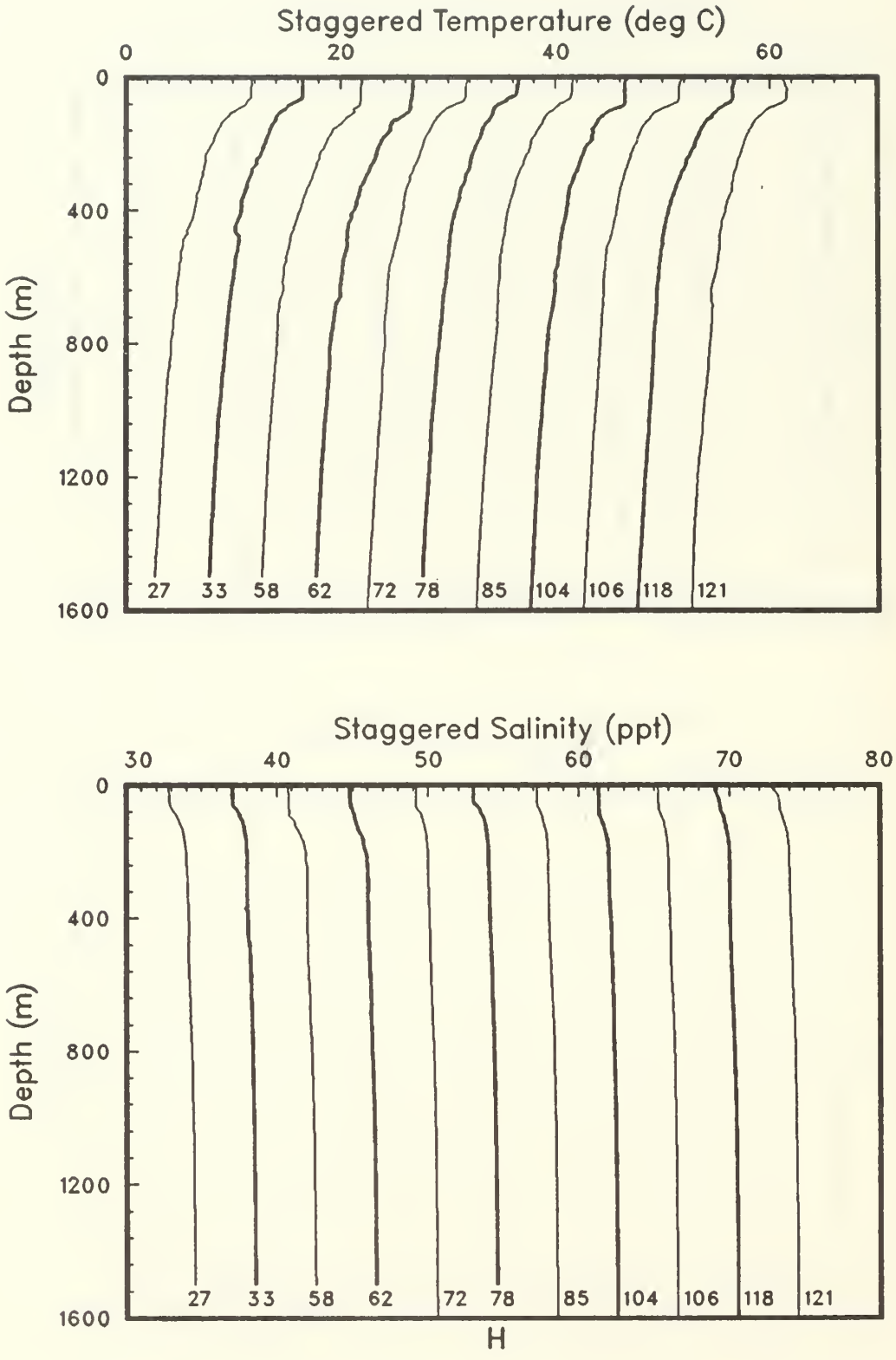

Figure 26: Casts deeper than 800m (OPTOMA15, Leg DII).

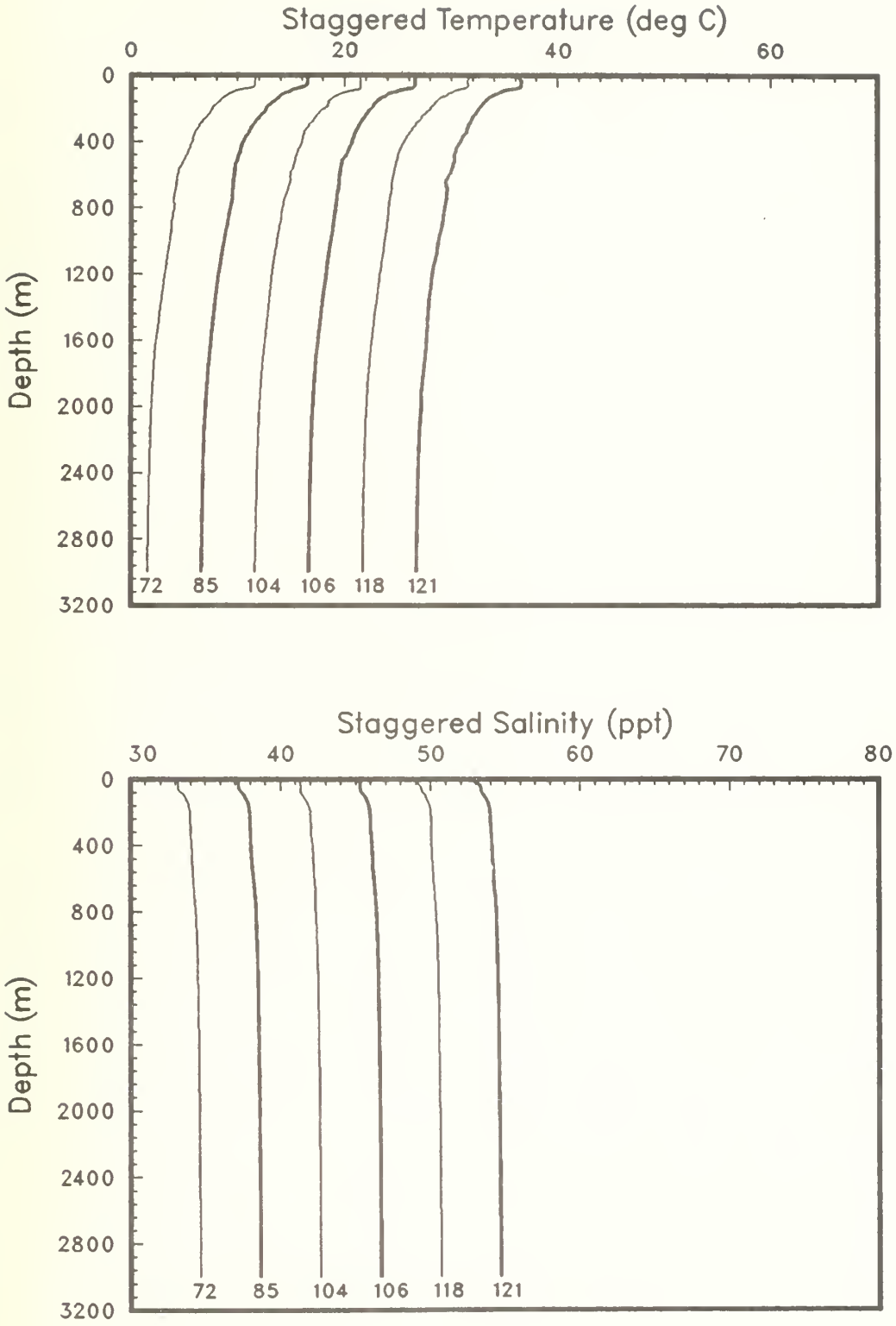

Figure 27: Casts deeper than 1600m (OPTOMA15, Leg DII).

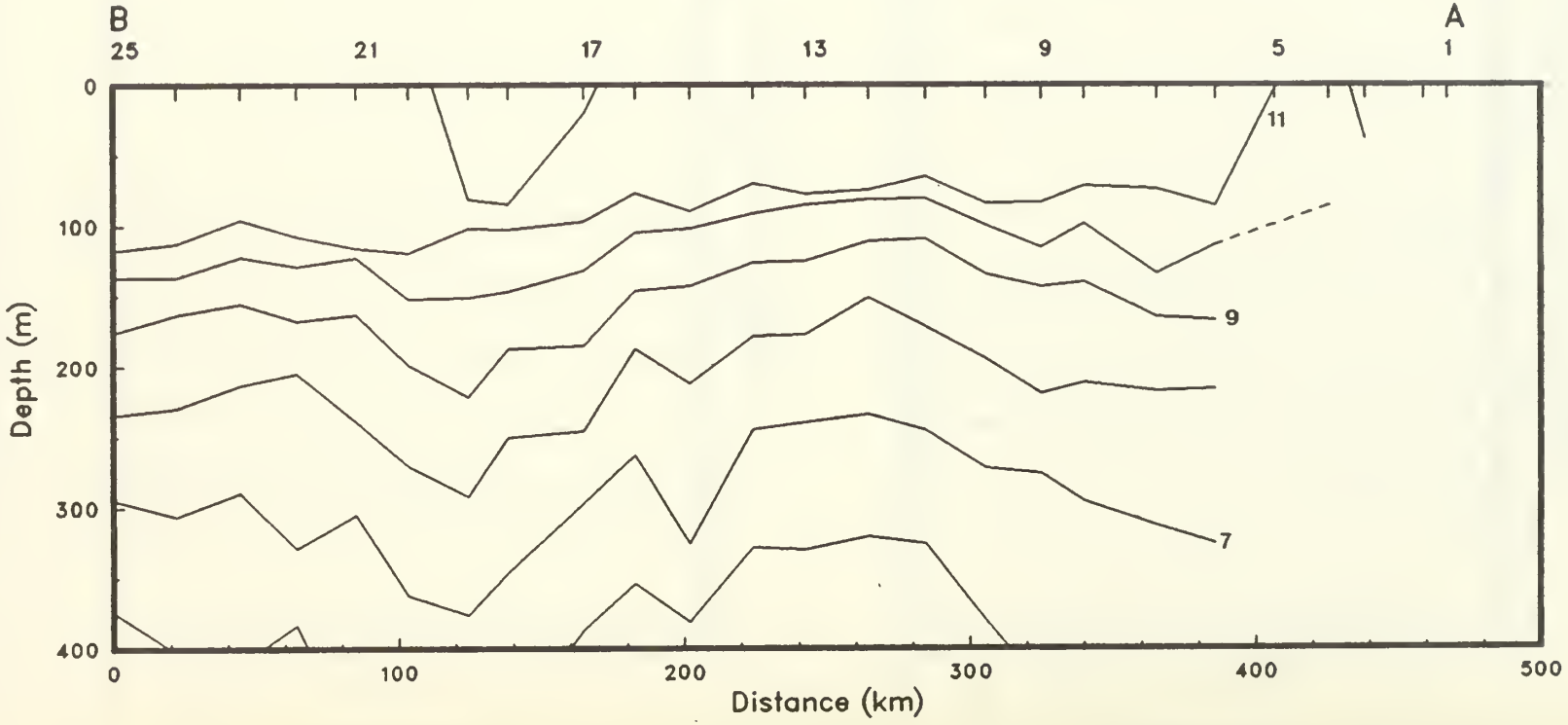

Figure 28(a): Along-track isotherms. Tick marks along the upper horizontal axis show station positions. Some station numbers are given. Dashed lines are used if the cast was too shallow (OPTOMA15, Leg DII).

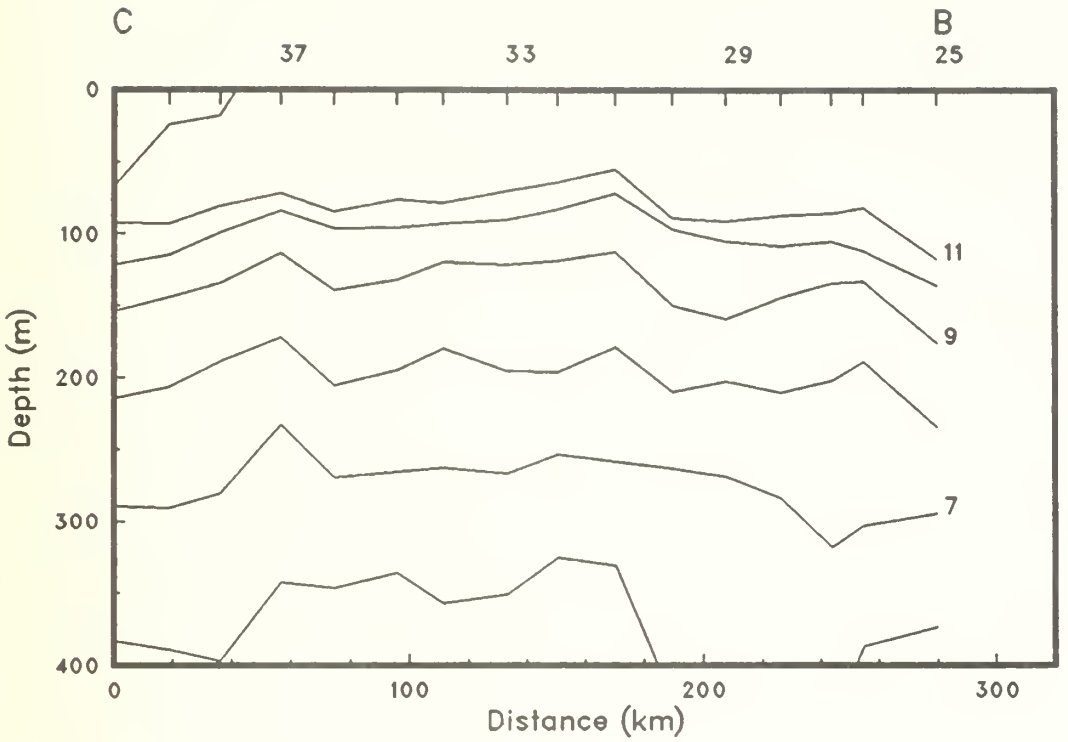

Figure 28(b)

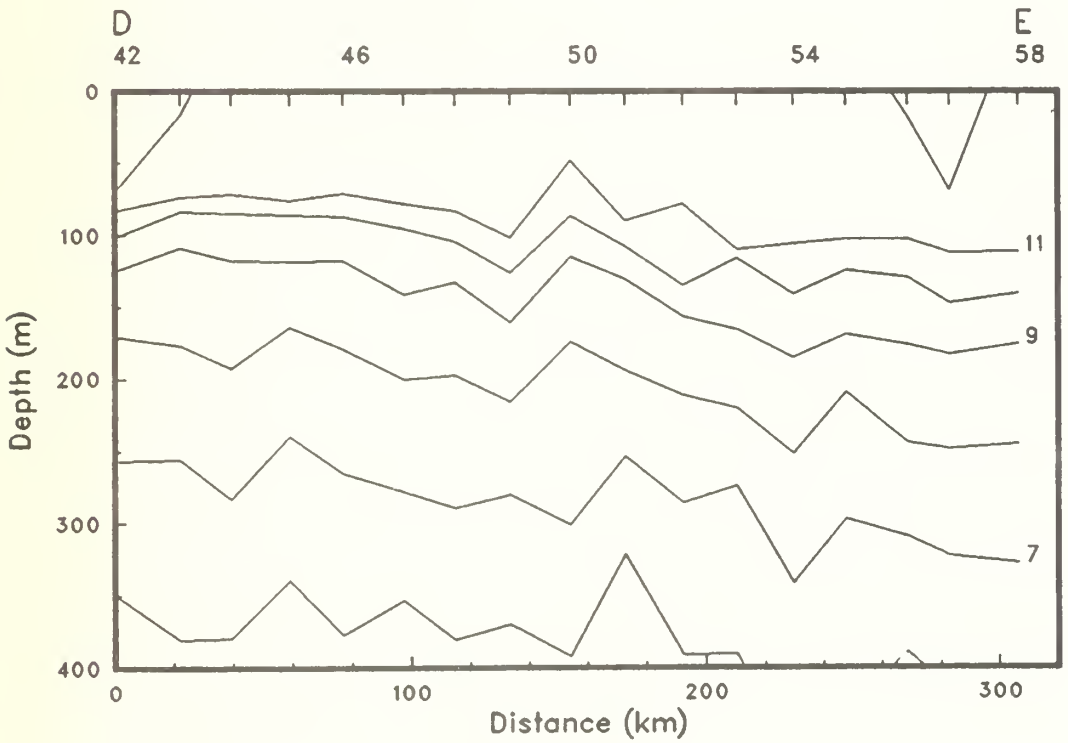

Figure 28(c)

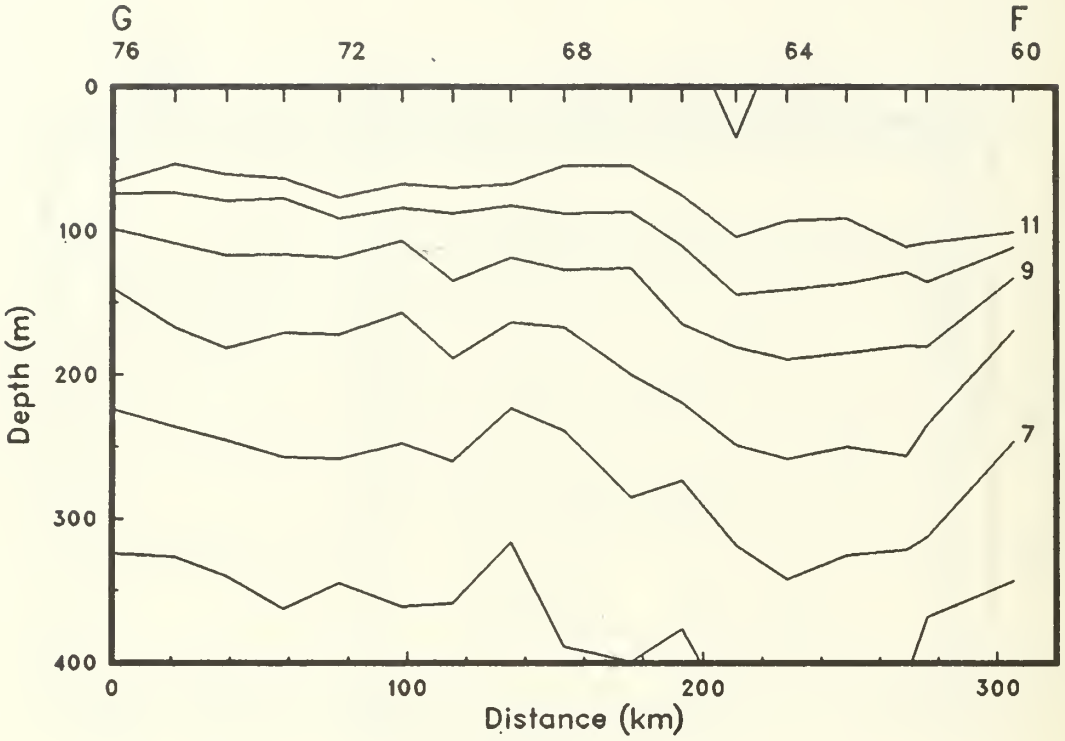

Figure 28(d)

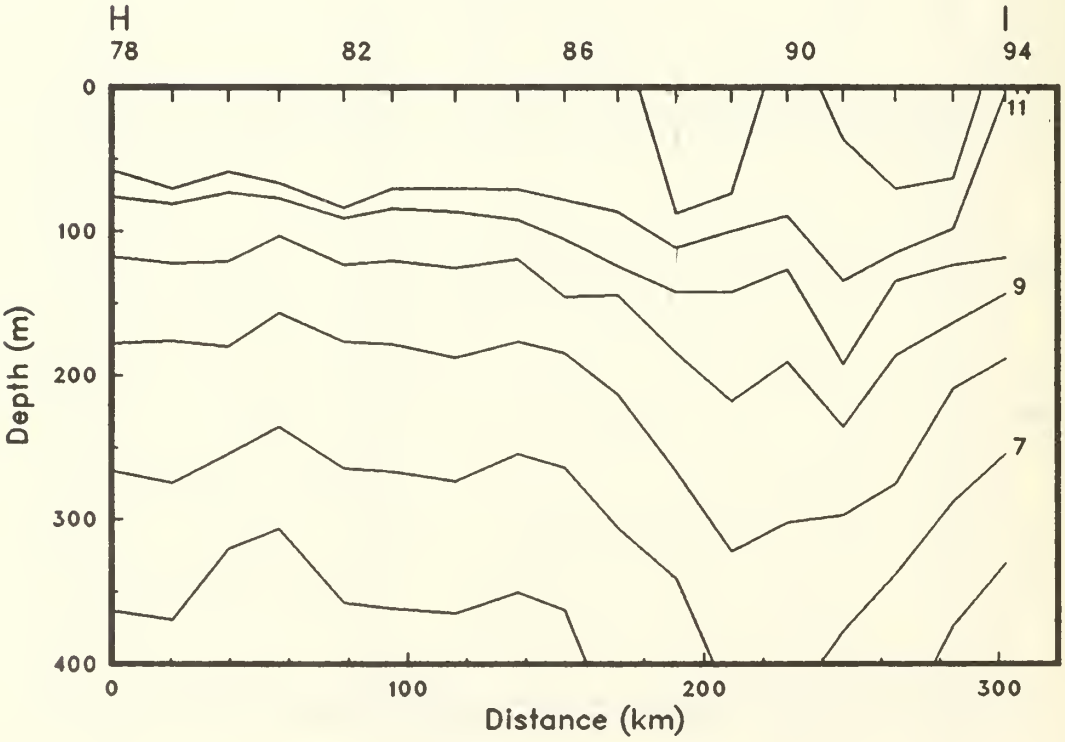

Figure 28(e)

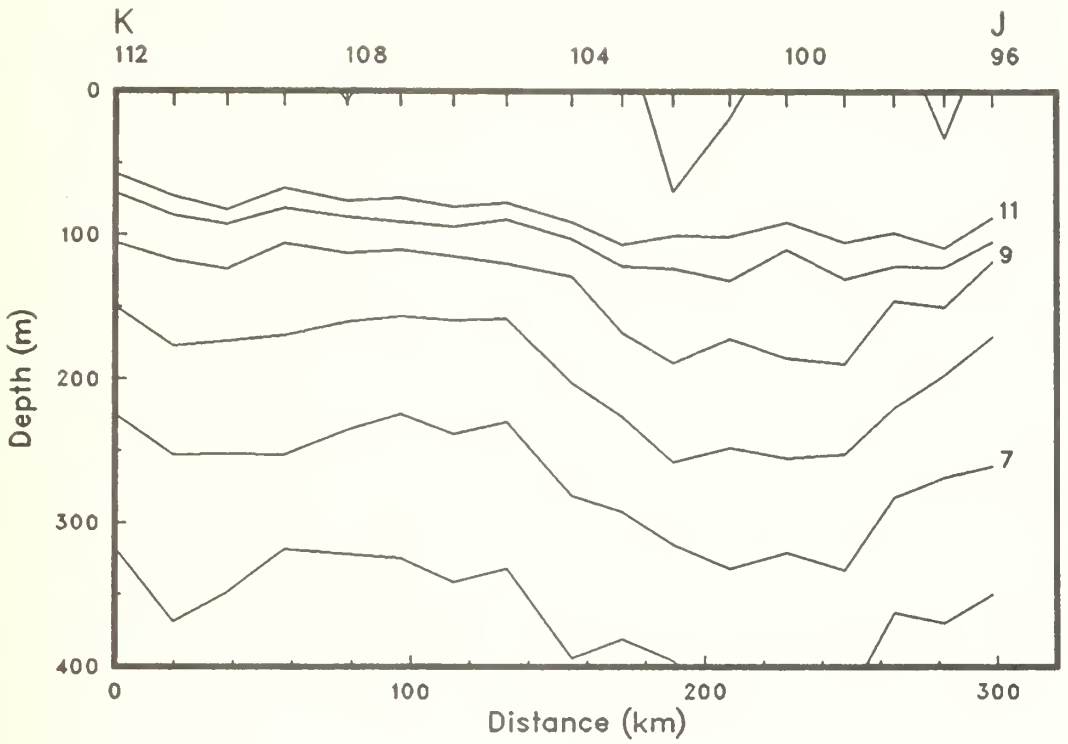

Figure 28(f)

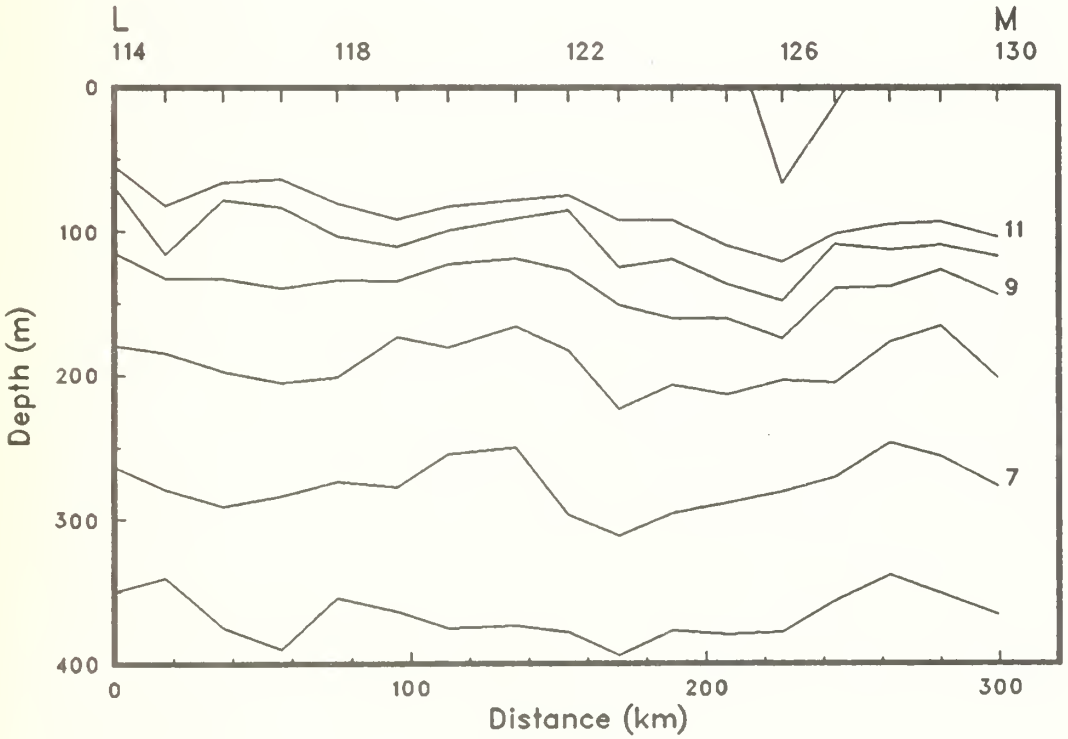

Figure 28(g)

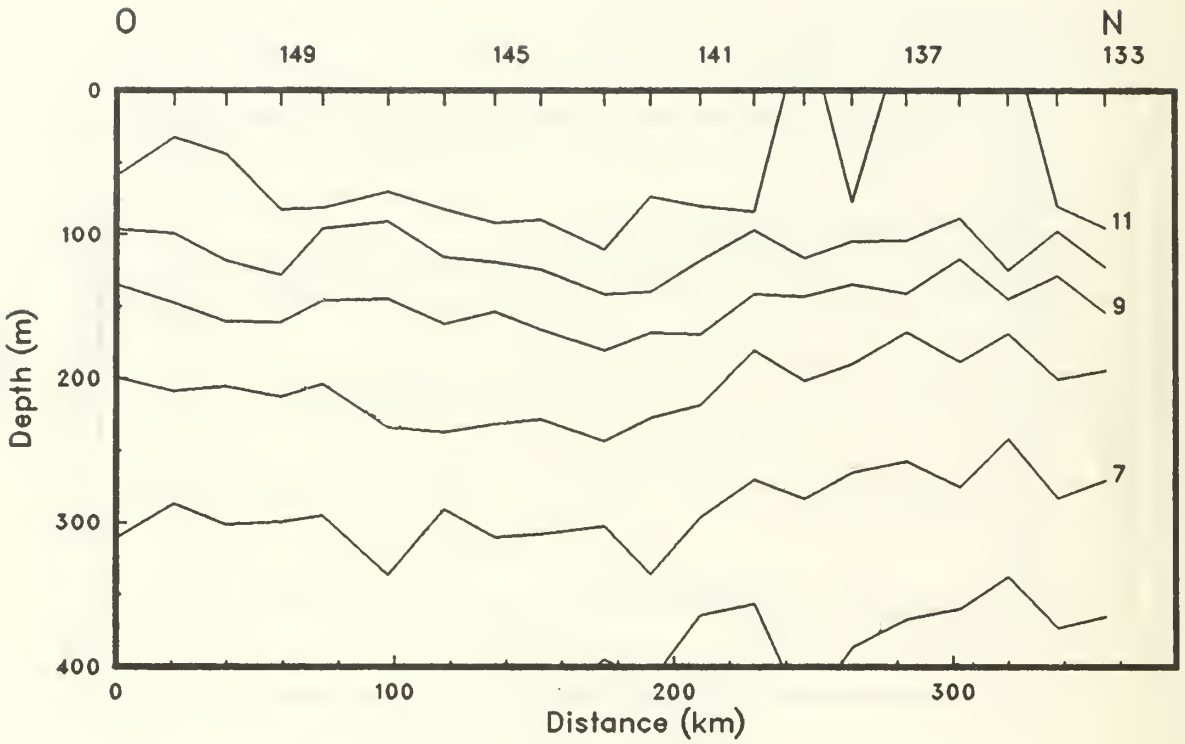

Figure 28(h)

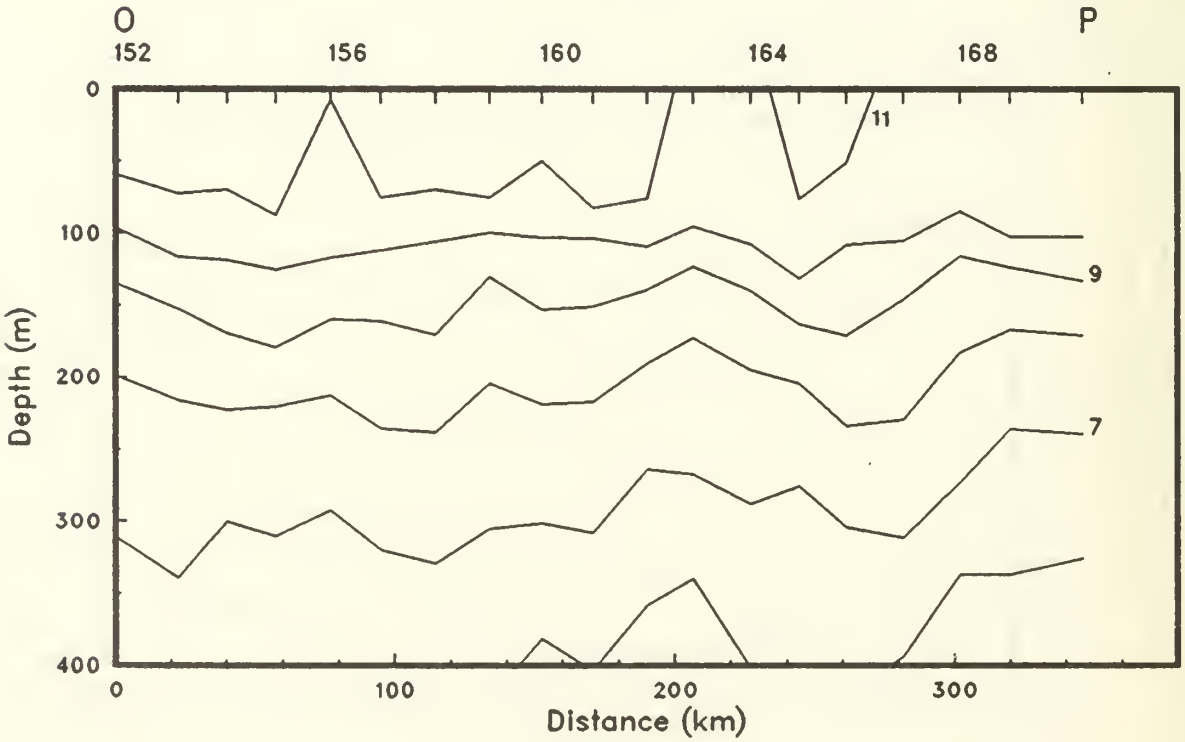

Figure 28(i)

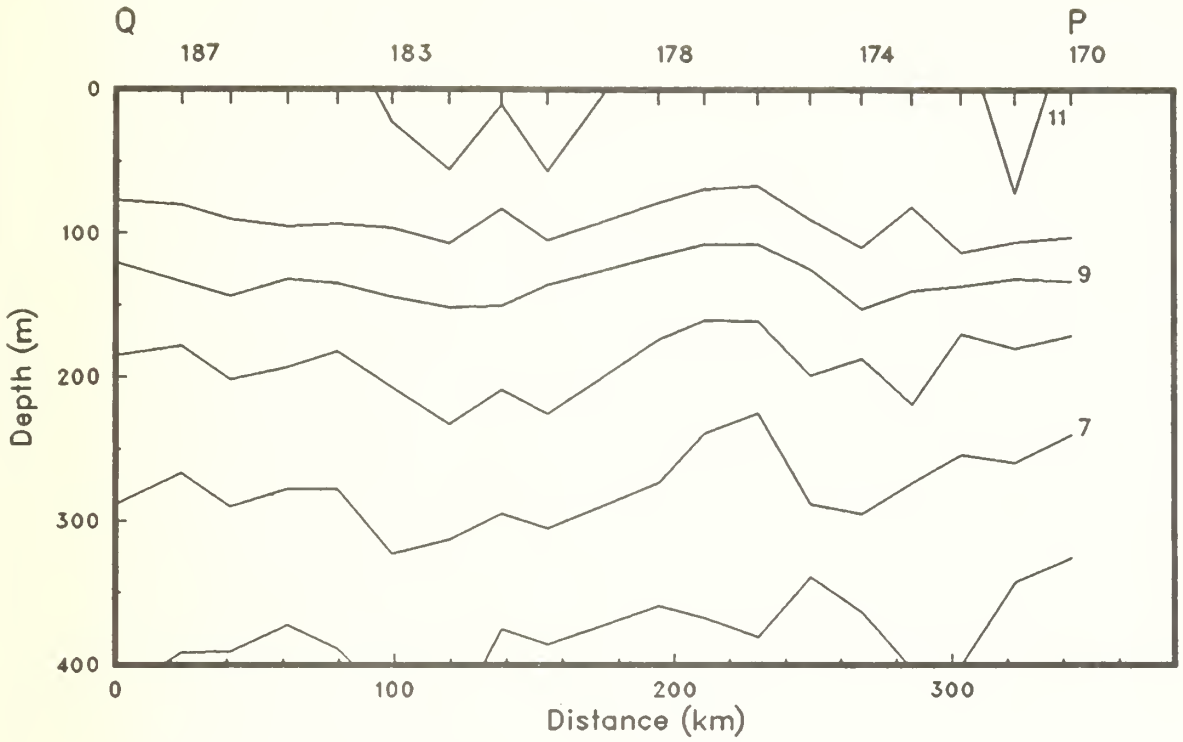

Figure 28(j)

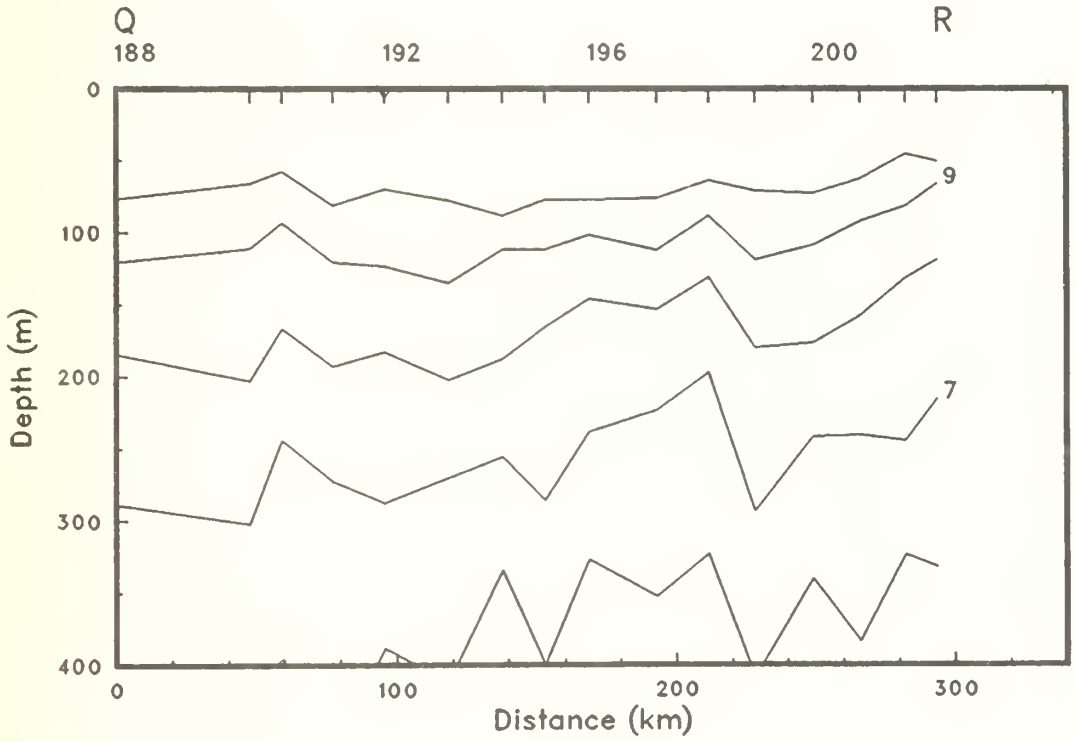

Figure 28(k)

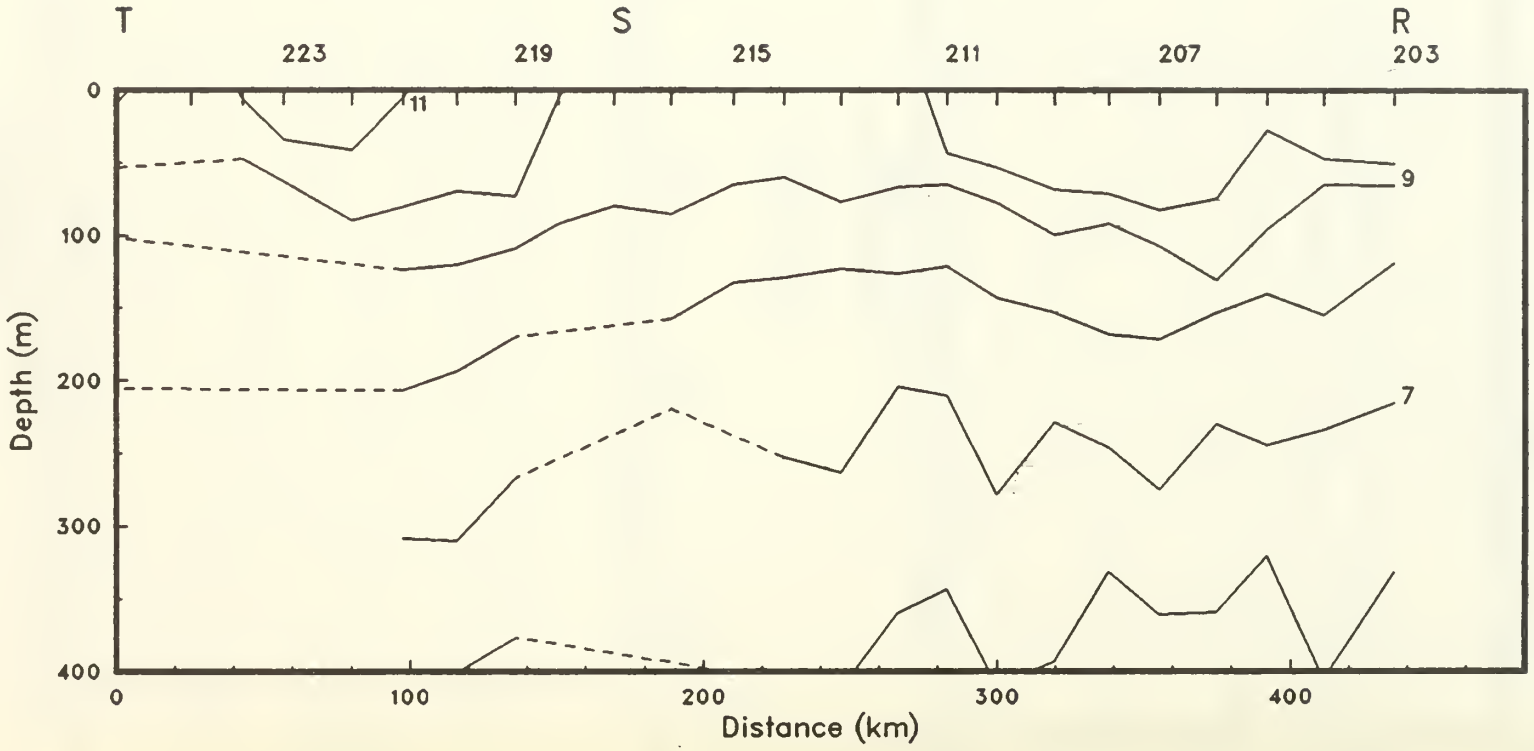
T
S
R
223
219
215
211
207
203
0
100
200
300
400
Depth (m)
11
9
7
0
100
200
300
400
Distance (km)

Figure 28(1)

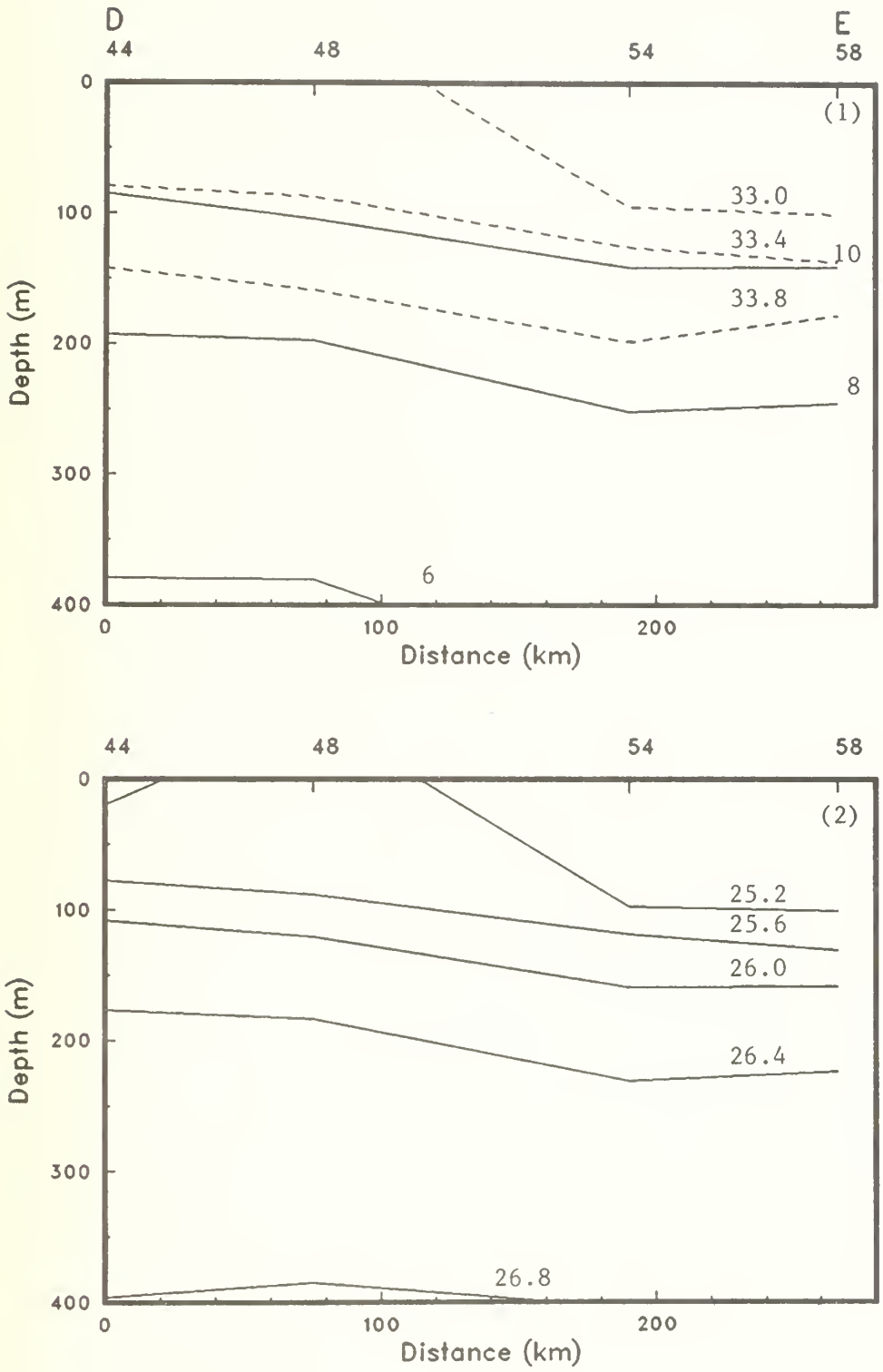

Figure 29(a): Isopleths of (1) temperature and salinity and (2) sigma-t from the CTD's (OPTOMA15, Leg DII).

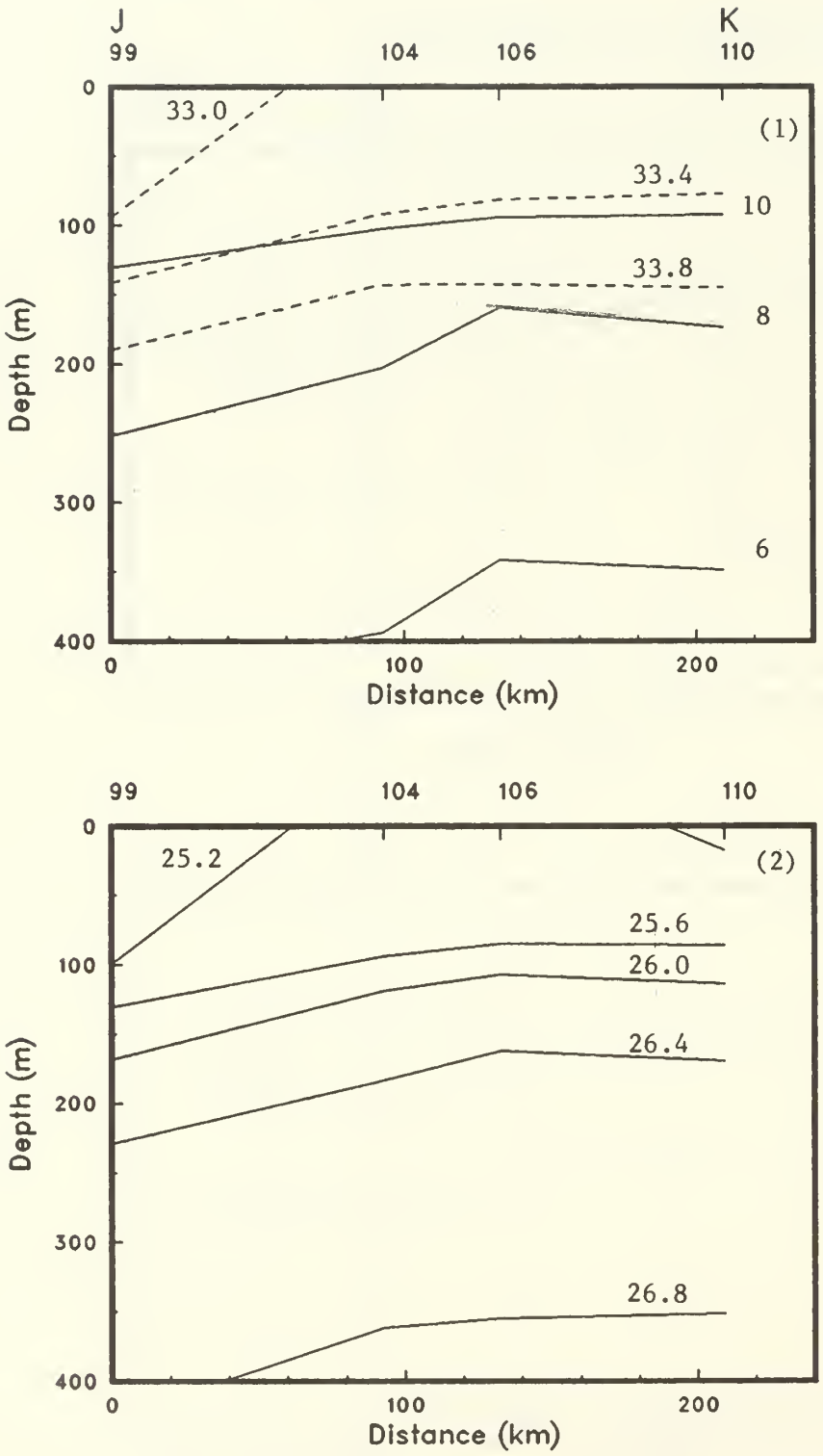
J
K
99
104
106
110
0
100
200
300
400
Depth (m)
33.0
(1)
33.4
10
33.8
8
6
0
100
200
Distance (km)
99
104
106
110
25.2
(2)
25.6
26.0
26.4
26.8
Distance (km)

Figure 29(b)

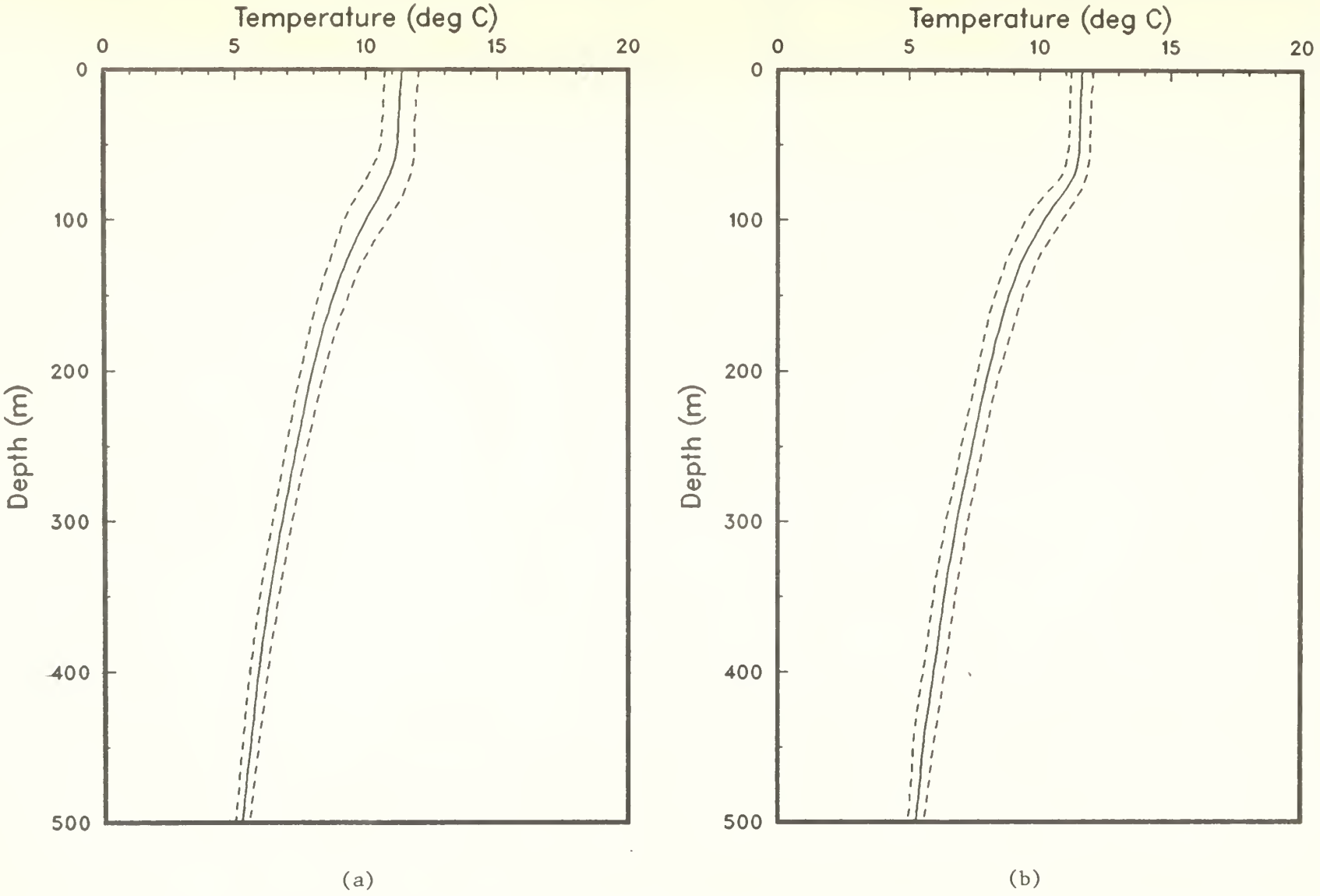

Figure 30: Mean temperature profiles from (a) XBT's and (b) CTD's, with + and - the standard deviation (OPTOMA15, Leg DII).

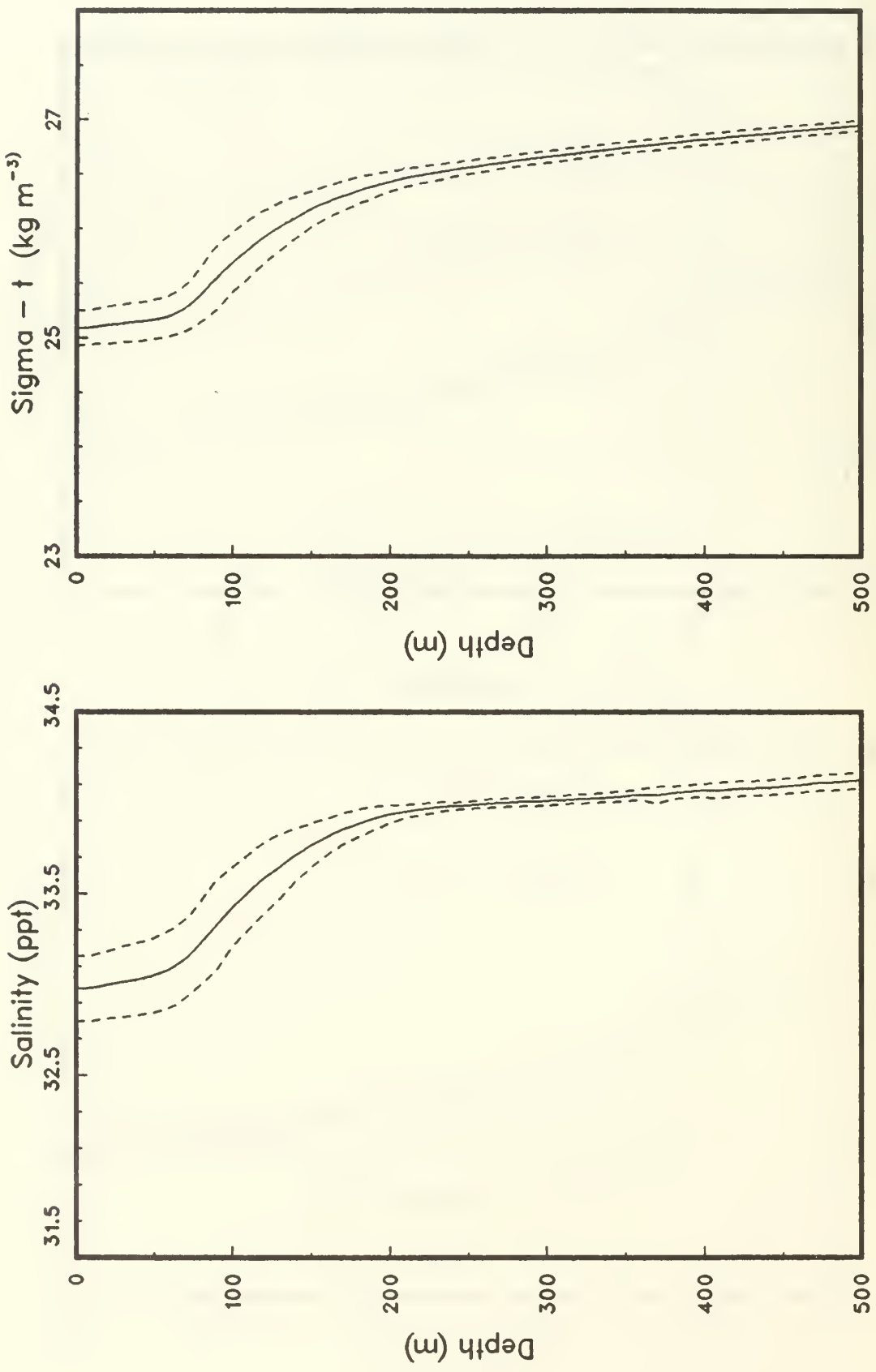

Figure 31: Mean profiles of (a) salinity and (b) sigma-t, with + and - the standard deviations, from the CTD's (OPTOMA15, Leg DII).

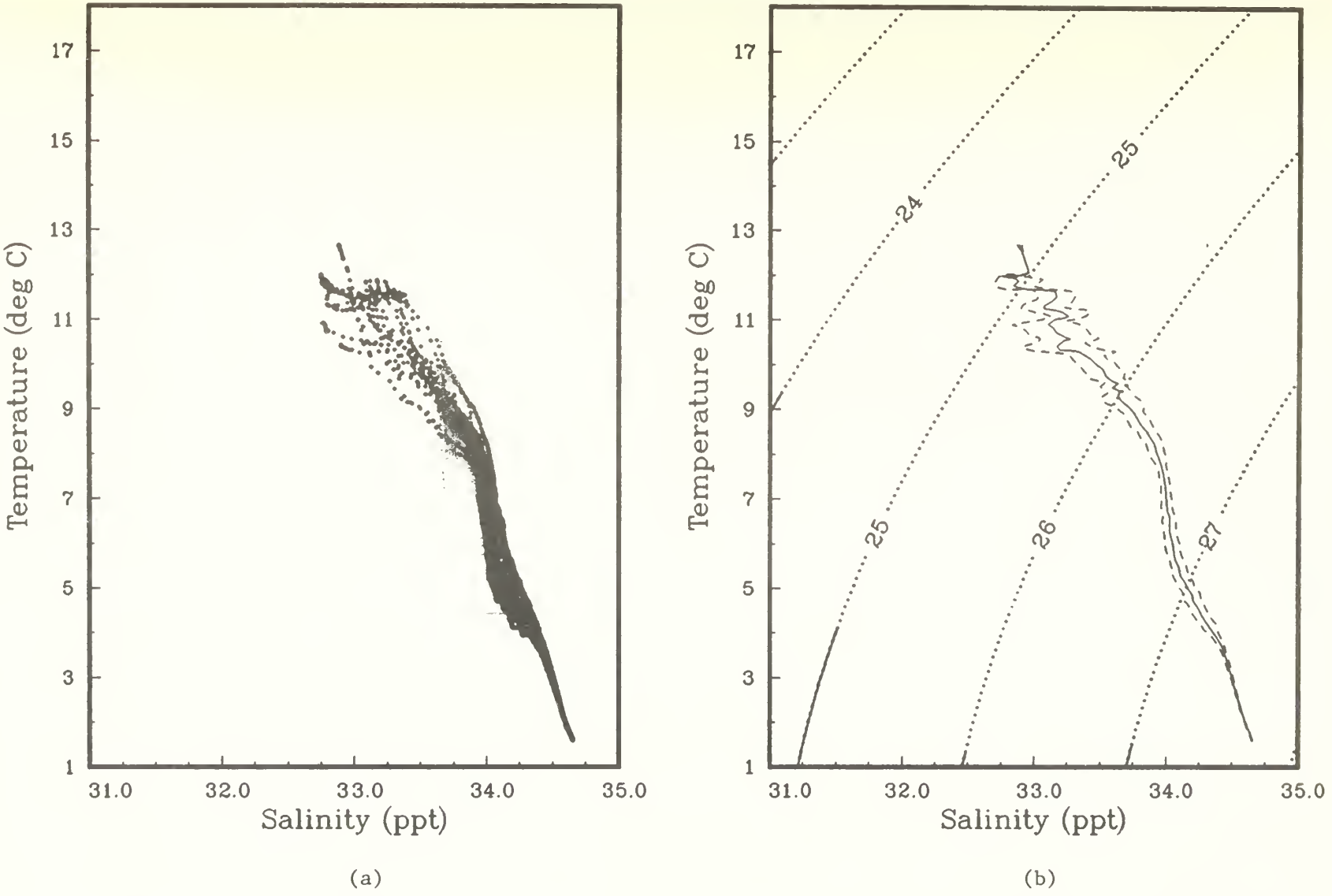

Figure 32: (a) T-S pairs and (b) mean T-S relation, with + and - the standard deviation, from the CTD's. Selected sigma-t contours are also shown (OPTOMA15, Leg DII).

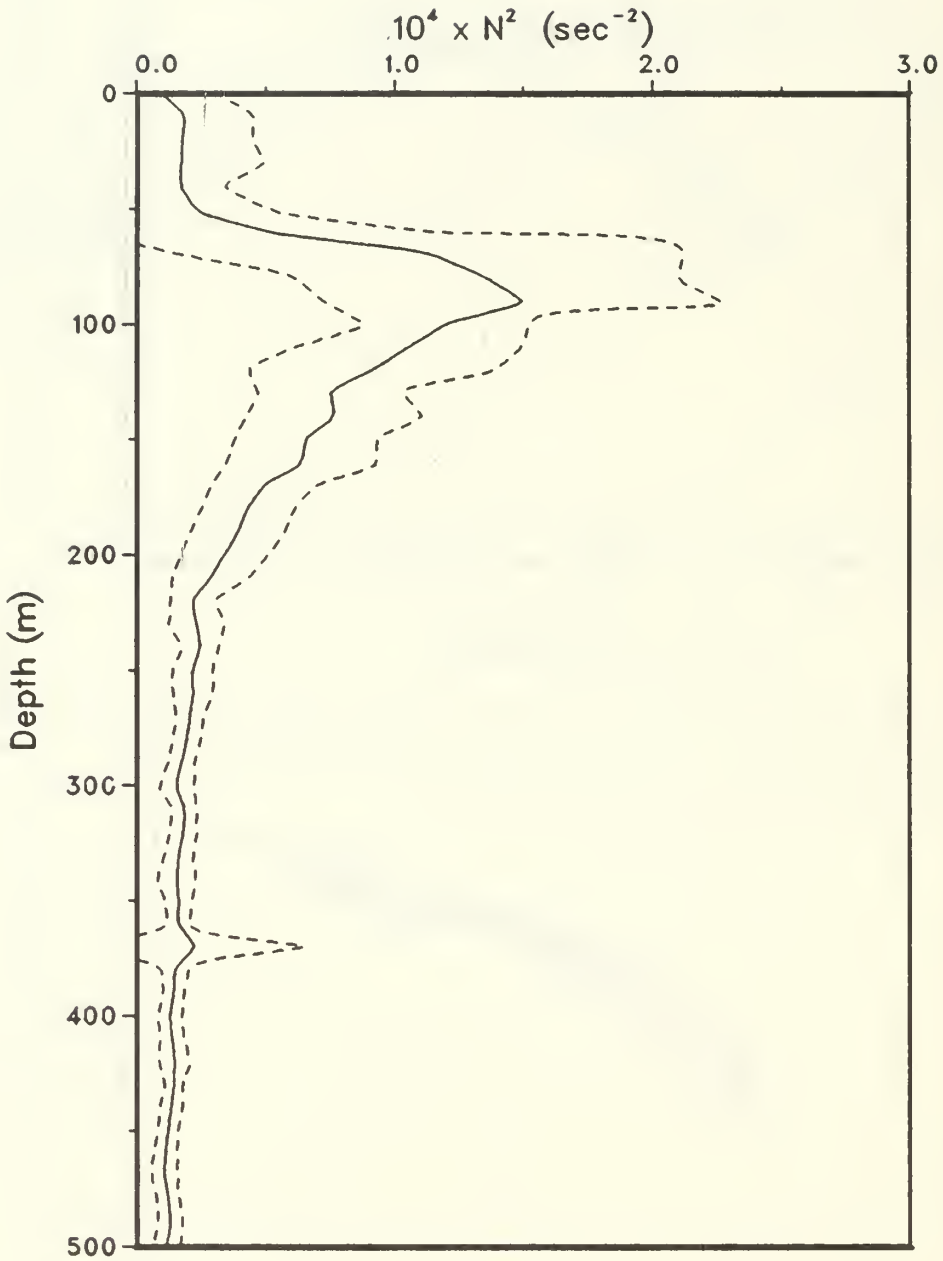

Figure 33: Mean N^2 profile (——), with + and - the standard deviation (----). The N^2 profile from $\overline{T(z)}$ and $\overline{S(z)}$ is also shown (....) (OPTOMA15, Leg DII).

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